DIET IN HEALTH AND DISEASE

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"These few rules of diet he that keeps, shall surely find great ease and speedy remedy by it."—BURTON

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TO

Sir William Osler, M. D.

AS A SLIGHT TOKEN OF OUR APPRECIATION OF HIS PERSONAL FRIENDSHIP, OF MANY FAVORS, AND OF THE ENCOURAGEMENT HE HAS ALWAYS GIVEN THE MEMBERS OF THE PROFESSION.

PREFACE TO THE SIXTH EDITION

DIETETICS was formerly an empiric branch of knowledge, as may be amply proved by reading any of the earlier works on diet, such as Muffett's Health Improvement. Slowly but surely scientific investigation has added fact after fact, and now dietetics may be regarded as probably at least half scientific and half empiric. One need only compare the first edition of this work with the present one to see what immense strides have been made in our knowledge of nutrition both in health and in disease. Chemical and biological methods have been applied to this subject and the results have been nothing short of marvelous.

The continued success of this book makes it a pleasure for the authors to present to those interested in the subject this account of practical dietetics. We have endeavored to present the subject free from fads or fancies. We have tried, as far as it is possible in one volume, to bring together the greatest possible number of facts relating to foods and nutrition in health and disease. The aim of the book is entirely practical, and when there was no new suggestion as to feeding we have given the ones generally employed in lieu of none. Unquestionably the next few years will see great changes in our views on diet. There are so many diseases concerning which there are but vague and uncertain ideas of their relation to diet. In many cases this relationship, if any, could and will be proved or disproved. Of these, cancer, skin diseases, arthritis, and many others are examples.

A great many additions and changes have been made in this edition, some sections have been entirely rewritten and others very largely, and among these are Sherman's tables of the salt content of foods, food poisoning, carotinemia, anaphylaxis, infant feeding, the food requirements of infants and children, weight, height, and age tables, goat's milk, dried milks, citrated milk, gelatin, celiac disease, diseases of the stomach and intestines, high blood-pressure, nephritis, rheumatoid arthritis, vitamins and the deficiency diseases, postoperative diets, and diabetes.

The authors gratefully acknowledge the assistance of Professor Bartgis McGlone in bringing the account of the physiology of digestion and absorption up to date, and to Dr. Manuel Gichner for his work in revising a large part of the article on Diabetes. We have tried to give the source of the various tables and procedures, and our thanks are due to all the authors whose work has been used.

Through a special arrangement with D. Appleton and Company and Dr. Edwin A. Locke it has been possible to add the valuable tables that have been prepared by Dr. Locke. The authors wish to express their indebtedness to both. They are indebted to the Director of the Connecticut Agricultural Experiment Station at New Haven for permission to use the valuable analyses of diabetic foods which are included under the heading of Diabetes.

Thanks are due to Professor H. C. Sherman for permission to include the table of vitamin content of foods and the salt content of foods, and to the publishers of the books from which they are taken, The New York Chemical Catalogue Publishing Company and the Macmillan Company respectively.

The authors wish also to express their thanks to W. B. Saunders Company for their uniform courtesy and consideration.

BALTIMORE, MD.,
January, 1925.

PREFACE TO THE FIRST EDITION

THIS book has been prepared to meet the needs of the general practitioner, hospital interne, and medical student, as well as for a reference handbook for training-schools.

The aim of the book is entirely practical. We have endeavored to give a reasonably concise account of the different kinds of foods, their composition and uses, and also to set forth the principles of diet both in health and disease. The greater part of the book is devoted to the sick, and we have tried to tell the doctor how to feed his patient. We have gone over the literature of the subject, much of which is inaccessible to the general practitioner, and have given what seems to us to be the most useful. We trust that the book is simple enough to be used for rapid reference by the busy practitioner, and that there is sufficient detail to make the way clear for the medical student and the uninitiated hospital interne. We have gathered together many diet-lists and recipes, which we trust will be of service both to the physician and to the nurse.

In the preparation of this work we have consulted many books and journal articles, and we are under obligation to the many authors whose names are mentioned throughout the book in connection with their contributions to the science of dietetics.

We are especially indebted to Dr. W. O. Atwater and his collaborators for much valuable material. We wish to express our thanks to the publishers, Messrs. W. B. Saunders & Co., for the courtesy they have shown in its preparation.

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DIET IN HEALTH AND DISEASE

THE CHEMISTRY AND PHYSIOLOGY OF DIGESTION

Food is the matter that is taken into the body to replace tissue waste or to supply nourishment. Every physical act utilizes part of the energy that has been derived from food, and the maintenance of the body heat consumes another part. In growing individuals a certain amount is utilized in building up new tissues.

Food as it is taken into the body differs very much in composition from the material that can be utilized in cell-growth and in replacing the tissue waste. The function of digestion is so to alter the food that it may be absorbed by the blood, and prepare it for assimilation and utilization by the various tissues. The food of mankind is most varied in nature, differing with the seasons, and with climates, races, and countries.

The study of foods is a most complex one, and until recently few scientific investigations along this line have been made. Fortunately, however, experiments are now being carried on the world over, and it is to be hoped that the subject of diet in health and in disease will soon be lifted out of the vale of empiricism where it has so long rested.

Water enters into the composition of every tissue in the body and forms more than 60 per cent. of the entire body weight of a full-grown man. As it is not burned up in the metabolic processes, it does not furnish any energy.

Salts.—The earthy salts, which form about 6 per cent. of the body weight of an adult man, furnish little if any energy. They are most abundant in the bones and teeth, but they also enter into the composition of other tissues and the fluids of the body. The principal salts of the body are calcium phosphate and the various compounds of potassium, sodium, magnesium, and iron. The mineral salts are very essential to life and health, as they maintain the normal osmotic pressure within the cells, and are necessary for the irritability and the structure of the tissues.

Proteins.—These are substances which contain nitrogen, are essential to life, and are regarded as combinations of the various amino-acids. In addition to carbon, hydrogen, oxygen, and nitrogen,

most proteins contain sulphur, and a great many phosphorus. In addition, certain proteins also contain iron, copper, iodin, manganese, and zinc.

The proteins are variously classified, and two classifications, based on the solubility, have been suggested, one by the English Society of Physiologists and one by the American Society of Biochemists.

American Classification of Proteins.

I. Simple proteins (protein substances which yield only as amino-acids or their derivatives on hydrolysis).	albumins globulins glutelins alcohol-soluble proteins (prolamines) albuminoids histons protamins
II. Conjugated proteins (substances which contain the protein molecule united to some other molecule or molecules otherwise than as a salt).	glycoproteins nucleoproteins hemoglobins (chromoproteins) phosphoproteins lecithoproteins
III. Derived proteins.	
Primary protein derivatives (formed through hydrolytic changes which cause only slight alterations of the protein molecule).	proteins metaproteins coagulated proteins
Secondary protein derivatives. (Products of further hydrolytic cleavage of the protein molecule.)	proteoses peptones peptids

Proteins are essential to life, and the body is constantly metabolizing it, whether any is being taken in or not. In ordinary life the body is in protein (or nitrogen) equilibrium, and an amount equivalent to that ingested is destroyed by the metabolic processes. It is difficult to get a positive nitrogen balance, that is, a greater intake than outgo, except after prolonged fasting or after recovery from wasting diseases or during the period of body growth. A negative balance is seen in starvation, where more is used up than is taken in, and in all wasting diseases, such as tuberculosis, in fevers, and hyperthyroidism. In pathological states, such as nephritis, there may be retention of nitrogen compounds in the body due to the failure of the kidney to excrete them, and if the amount exceeds a certain amount a condition of poisoning and uremia is brought about.

Protein Sparers.—A certain amount of protein is essential, and the nitrogen equilibrium may be established at various levels and the amount necessary for tissue activity readily replaced. What protein that might be required for the production of energy may be replaced by fats and carbohydrates which are regarded in this sense as protein sparers. Alcohol also acts as a protein sparer.

Protein is metabolized by various chemical processes into chiefly

urea, ammonia, carbon dioxid, water, and the nitrogen-free residues of the deaminized amino-acids. In the processes of digestion the proteins are hydrolized to amino-acids and as such absorbed. (See same.)

Superior and Inferior Food Proteins.—Some food proteins are better suited for human food than others, because when broken up into their elementary parts or amino-acids more of these can be utilized in forming the various body tissues than those derived from other foods. For this reason the proteins of milk, meat, eggs, and fish are most valuable, those of rice and potatoes next in value, while those of wheat, maize, and beans are distinctly inferior.

Thomas has shown that the relative value of these proteins are as follows:

Meat protein	30	grams
Milk protein	31	"
Rice protein	34	"
Potato protein	38	"
Bean protein	54	"
Bread protein	76	"
Maize protein	102	"

Thus it is plain that the vegetable proteins are not as suitable for repairing tissue waste, although, if sufficient amounts are taken, life may be maintained.

Casein contains all the amino-acids necessary for growth of human tissues except glycocoll, but the human body can make glycocoll from casein. The inferior proteins may be used to furnish heat and form ammonia and urea, and the other parts are easily oxidized until the end-products are water and carbon dioxid.

Carbohydrates.—Carbohydrate is a name applied to compounds of carbon, hydrogen, and oxygen as they occur in plants and animals, and the name is used because most, not all, contain their hydrogen and oxygen in the same proportion as it is found in water, that is, two of hydrogen to one of oxygen. Some substances with the same proportions are not carbohydrates, as lactic acid, $C_3H_6O_3$, or acetic acid, $C_2H_4O_2$. The chemical properties are perhaps more characteristic. They are at least the simpler ones, reducing agents, that is, they give up their oxygen readily. They have a neutral reaction in aqueous solution, but possess weakly acid and basic characters. They may be classified at present as follows:

Monosaccharids.—*Levulose or Fructose.*—This is one of the sweetest sugars and is found in nature in fruits and as a constituent of various di- and polysaccharides. Thus it is found in sucrose, melitose, lupeose, and inulin. It may be prepared by the hydrolysis of cane sugar by sulphuric acid, and when pure occurs in white needle-like crystals or in a dense mass which becomes light yellow on standing, especially if exposed to light.

Dextrose, d-Glucose or Grape Sugar.—This is the result of the

CARBOHYDRATES	I. Monosaccharids	1. Bioses.	Aldose.	*Glycolaldehyde.*
		2. Trioses.	Aldoses.	*Glycerose.*
			Ketoses.	*Dioxyacetone.*
		3. Tetroses.	Aldoses.	*Erythose.*
			Ketoses.	*d-Erythrulose.*
		4. *Pentoses.*	Aldoses.	*Arabinose, xylose, ribose.*
			Ketoses.	*l-Arabinulose.*
		5. *Hexoses.*	Aldoses.	*Dextrose, galactose, mannose.*
			Ketoses.	*Levulose, sorbose.*
		6. Heptoses.	Aldose.	*d-Mannoheptose.*
	II. Disaccharids	1. *Lactose.*	(Glucose + galactose.)	
		2. *Maltose.*	(Glucose + glucose.)	
		3. *Saccharose.*	(Glucose + levulose.)	
		4. Trehalose.	(Glucose + glucose.)	
		5. Melibiose.	(Galactose + glucose.)	
	III. Polysaccharids	1. Trisaccharids.		*Melitose* (Raffinose) *in molasse.* *Melizitose.* (Pinus larix.) (Levulose + glucose + galactose.
		2. *Tetrasaccharids.*		*Lupeose* in peas; *stachyose* (Lupeose consists of two molecules of galactose, one of glucose, and one of levulose.)
		Colloidal polysaccharids.		Dextrins. Glycogen. Cellulose. Starch. Mucilages. Gums. Inulin.

action of dilute acids on starch and forms the principal part of commercial glucose. It is found in cane sugar, in fruits, in the sap of plants, and in the blood of many animals. Commercial glucose or corn syrup is usually made by the action of dilute hydrochloric acid on

corn starch or on potato starch. It usually contains an admixture of dextrins and not infrequently impurities. In former times, when it was largely made by using sulphuric acid, arsenical poisoning resulted from the acid containing arsenic. In these cases the glucose was used to make beer which contained arsenic.

d-Galactose.—This is found as one of the constituents of milk-sugar or lactose, the other being glucose. It is found in nerve sheaths and in the brain and in plants.

Glucosides.—These are found in plants and animals and on hydrolysis form glucose or some other monosaccharid.

Disaccharids.—These yield two molecules of monosaccharids on hydrolysis as follows:

Disaccharide.		Occurrence.	Yield on hydrolysis.
Cane sugar.	(Sucrose) (Saccharose)	Sugar cane; beets (Saccharum officinarum)	Levulose Dextrose
Maltose		Germinating barley Digestion of starch	Dextrose Dextrose
Lactose		Milk	Dextrose Galactose
Trehalose		Various fungi. Boletus edulis. Ergot. Trehala	Dextrose Dextrose
Melibose		From melitose in molasses Australian manna	Galactose Dextrose

(See also under heading of *sugar.*)

Lactose.—This is found in the mammary gland and is found in milk. It is not as sweet as cane sugar. Commercial milk contains many impurities, so that only the refined product is suitable for infant feeding.

Maltose.—This is found most widely in nature, both in plants and animals, as it is formed by the action of amylase in starch. It crystallizes in white needles, is not as sweet as cane sugar, and ferments readily. It seems possible that maltose may be utilized directly by the tissues, and it has been suggested for use in feeding, especially infants and invalids, under certain conditions.

Polysaccharides.—These are either insoluble or form colloids in aqueous solutions, and are represented by starch, glycogen, dextrins, cellulose, various gums, mucilage, and inulin.

Glucose Tolerance.—Woodyatt and Sansum and Wilder have determined that a man weighing 70 kilograms when resting quietly in bed may receive and utilize 63 grams of glucose by vein per hour. This amounts to 252 calories per hour or 6,048 per day, or over double his requirements. The normal tolerance limit is near 0.85 gram glucose per kilo of body weight hourly, which corresponds to the figures of Blumenthal determined on animals. In Graves' disease the

tolerance limit was 0.65 gram per kilo an hour. (See also Wilder and Sansum, The Archives of Internal Medicine, 1917, xix, page 311.)

Levulose tolerance is 0.15 gram per kilo an hour, galactose 0.1 gram, and lactose approaches 0. When glucose is given faster than the tolerance it causes glycosuria and diuresis. If the amounts given are much in excess of the tolerance the diuresis is remarkable and may lead to dehydration, and if continued, enormous quantities of fluid may be required which may lead to heart failure.

By mouth the amounts of the various sugars necessary to produce glycosuria are given by Von Noorden as follows:

Milk sugar, more than 120 grams.
Cane sugar, more than 150 to 200 grams.
Fruit sugar, more than 200 grams.
Grape sugar, more than 200 to 250 grams.

Glycogen.—One of the most important functions of the liver is the so-called glycogenic function. In 1857 Claude Bernard demonstrated the presence of glycogen and formulated a classical theory regarding its place in nutrition. Glycogen is soluble in water and has the same chemic formula as starch. Toward digestive juices it also behaves like starch, and the end-products are the same as in the case of starch, namely, maltose and dextrose. It is commonly known as animal starch. With iodin it gives a reddish instead of a blue color as obtained with ordinary starch. Glycogen is formed synthetically in the liver from the monosaccharids by the process of dehydration and condensation. It is then stored in the liver cells. The muscles also act as a store-house for glycogen. Lactose must first be split into dextrose and galactose in the intestine before it may be transformed into glycogen, and advantage is taken of this fact in using lactose in a test for renal function by injecting it directly into the blood. There are several theories regarding the way glycogen is used. Bernard thought the liver acted as a store-house and regulator, the glycogen being converted into dextrose and conveyed to the muscles through the blood. When the sugar content of the blood falls below the normal level, the liver delivers dextrose to the blood. If the amount of sugar in the blood exceeds a certain percentage it is excreted by the kidneys. A special enzyme, called glycogenase, has been described in the liver as the active agent in causing the transformation. Pavy believes that the carbohydrate molecule is fastened on to the protein molecule in the liver and thus conveyed to the muscles, where it is set free. In starvation the glycogen part of the liver is first used up and the muscles are found to contain a considerable amount, even after the liver has become glycogen free. The difference that exists between the muscles and liver supplies of glycogen have been compared to the difference between retail shops where the material is supplied immediately to the consumer, and the warehouse where it is stored in large quantities.

Glycogen may also be formed from the proteins of the body, as has been proved experimentally. This occurs pathologically in diabetes. Fats may also apparently be converted into glycogen, but there is a question as to how far this actually occurs in the human body, and some believe that it only takes place under certain pathological conditions.

Fats and Allied Substances.—There is a group of substances popularly called fats, a term which refers more particularly to one member of the group which includes fats, oil, waxes, phosphatids, sterols, and a few other substances. It has been suggested that the whole lot be called lipins. They have in common certain properties, they are greasy, insoluble in water, soluble in chloroform, alcohol, ether, and other fat solvents. Fat enters into the composition of protoplasm and enables it to take up water without dissolving. The fats of the body are esters of glycerin (called by some authors glycerol). Glycerin is a triatomic alcohol, and all those of the hydroxyl groups are replaced by acid radicals, palmitic, stearic, and oleic acids, as a rule, but others, as butyric acid, occur. Fats are sometimes referred to as triglycerids. Fats, in a limited sense, are esters of glycerin and fatty acids, which are solid at 20° C. Different fats vary in their melting-point. Body fat is a mixture of stearin, palmitin, and olein, and its melting-point is 25° C. Olein has a melting-point at 5° C., palmitin 45° C., and stearin varies from 53° to 65° C.

Fatty oils are neutral esters of glycerin and fatty acids, liquid at 20° C. These are divided into drying oils, as linseed oil, which dries and hardens on exposure to light and air; semidrying oils, as cotton-seed oil, which thickens gradually on exposure; non-drying oils, as olive oil, which neither dries nor thickens; and essential oils, as oil of cloves, which are generally volatile and odiferous.

The Metabolism of Fat.—The fat is utilized in the body to build up the fatty tissues and it enters very largely into the composition of the red bone-marrow. It is also used in the formation of protoplasm. The fats are oxidized until they are reduced to carbon dioxid and water, but the intermediate changes that take place are not very well understood at this time. The long carbon chains of the higher fatty acids are broken down by oxidation.

Some of the fats may form sugar, as in diabetes, but the changes by which this is possible are not understood.

Fats are also transformed into the important phosphatids, as lecithin and cerebrin, into cholesterin, and the bile acids.

Foreign fats may be absorbed as such and be deposited in the body as such, and apparently utilized by the body in the same way as ordinary fat. It is believed that fatty tissue derived from mutton is firmer and more resistent than that formed from the oils.

Part of the fats of the body are derived from the transformation of

carbohydrates. Thus carbohydrates contain more oxygen, and it has been suggested that after part of the oxygen has been used the remaining carbon compounds form fatty acids.

Part of the fat is also formed from protein. This fat is the deaminized residue of the amino-acids of the protein. These may also form sugar.

Apart from fats stored up as such, lipins make up varying amounts of the animal body, the greatest amounts being in the brain and adrenal.

Fats and oils contain less oxygen in proportion to their carbon and content as compared to carbohydrates. Fats are solid at ordinary temperatures, while oils are fluid. The fatty acids of the fats are nearly or totally saturated, while those of the oils are not. It is interesting from a food standpoint to note that not all fats are the same in their relation to the growth of young animals. Certain fats evidently contain vitamines, while others do not. Thus they are present in butter and absent in olive oil. Mendel and Osborne found that young rats did not grow as rapidly when fed on oleomargarine or butterine as when fed on butter.

DIGESTION AND ABSORPTION

DIGESTION

Food, in order to be used by the body, must be digested, and this process of digestion is a complicated one. It might almost be said to begin before the food is eaten, as it is greatly influenced by appetite, smell, sight, and the surroundings. These subjects will be mentioned more fully later on. Good food prepared in a skilful manner, pleasant to see, to smell, and to taste, taken in comfortable surroundings, with cheerful companions, will be digested with ease by normal individuals, while the reverse of all or any of these may cause indigestion due to the mental action upon digestion, chiefly, perhaps, on the digestive glands. Pawlow has made a most fascinating study of this subject, to which the reader is referred.[1]

The Passage of Food Through the Alimentary Tract.—The first step in the digestion of food is mastication. By this means the food is ground to a fine pulp and thoroughly mixed with saliva. It is necessary to have good teeth, and the importance of the care and preservation of the teeth cannot be too strongly insisted upon. Defective teeth are a menace to health, as they lead to the food's being imperfectly masticated, and the constant absorption of toxic material may affect both digestion and the general health. In the process of chewing the muscles of the cheeks and lips serve to keep the food in the line of the teeth, and when the facial muscles are paralyzed mastication may be difficult.

Deglutition is usually a reflex action and is generally involuntary,

[1] Pawlow, The Work of the Digestive Glands.

although it may be begun by a voluntary effort. The food passes with varied rapidity from the mouth through the pharynx and esophagus into the stomach. To be easily swallowed the food must be moist and on the tongue, and it is difficult or impossible to swallow dry food. Liquid or very soft food may pass directly into the stomach in as little as 0.1 second, but semisolid and solid food are forced down the esophagus by a sort of peristaltic movement, taking as long as six seconds to reach the stomach. There may be a delay of from four to eight seconds at the cardiac sphincter. Paralysis of the soft palate causes the food to be regurgitated through the nose when swallowing is attempted, and if the muscles of the pharynx or larynx are paralyzed, the food may be aspirated into the trachea, bronchi, or lung, and so set up a bronchopneumonia.

Food remains in the stomach until it has been reduced to more or less of a liquid, when it is forced through the pylorus from time to time. Our knowledge of gastric movements dates from the classic experiments made on Alexis St. Martin by Beaumont, and a great deal of research has been devoted to the subject in recent years. The fundus of the stomach acts as a reservoir for the food, while the pyloric end serves to grind and macerate it until it is forced out of the stomach into the duodenum, the pylorus apparently opening under the stimulus caused by the combination of the food being liquid in character and acid in reaction. In the duodenum the acid causes the pylorus to close. The order in which the food is digested depends somewhat on the order in which it is ingested and the amount of fluid taken with it. For example, if carbohydrates are fed first and then proteins, the carbohydrate passes almost immediately into the small intestines; if, however, the protein is fed first, the carbohydrate remains in the stomach much longer.

Hedblom and Cannon have summarized the results of their investigations on the passage of food from the stomach as follows:

If carbohydrate food is thinned by adding water there is, within limits, very little change in the rate of exit from the stomach; but adding water to protein food tends to make the discharge more rapid. When hard particles are present in the food the rate of outgo from the stomach is notably retarded. Coarse, branny food leaves the stomach slightly faster than similar foods of finer texture. The presence of gas in the stomach delays gastric discharge, an effect due to the gas preventing the walls of the stomach from exerting the normal mixing and propelling action on the food. No considerable variation from the normal rate of exit from the stomach is observed when the food is fed very hot or very cold. Food with approximately normal acidity leaves the stomach much faster than food which is hyperacid (1 per cent.), a result in harmony with other observations on the acid control of the pylorus. Feeding acid food is followed by deep and rapid peristalsis. Massage of the stomach, even when extensive, has

very slight influence on the passage of food through the pylorus. Irritation of the colon (with croton oil) notably retards gastric discharge, and delays the movements of food through the small intestine.

In the intestine the food is moved forward by the peristaltic movements; a wave of relaxation moves along the intestine followed by a wave of contraction, and this serves to pass the contents of the bowel downward. Antiperistalsis is said not to occur under normal conditions; it may occur in injury or disease of the intestine, especially an intestinal obstruction. In addition to this general movement there are local rhythmic movements occurring at the parts of the intestine occupied by food. The mass to be digested is separated into numerous small masses by this movement, and then these are swept together and also onward by the wave of peristalsis. The length of time that a meal takes to pass from the stomach to the large bowel varies, but it is about four hours on an average, and the first part of the meal may be at the ileocecal valve by the time the last of it leaves the stomach. Various things may upset the movements of the intestines. A sudden disturbance of circulation in the bowel may cause violent movements, and dyspnea may either increase the movements or stop them altogether. The organic acids formed in the bowel as the result of the bacterial action act as stimulants to intestinal movement.

The movement through the large intestine is slow, as it is there that most of the water is absorbed. The passage of the intestinal contents is delayed in the ascending colon by antiperistaltic movements. According to the observations of Hertz the feces take two hours on an average to pass from the ilocecal valve to the hepatic flexure, and about four and a half hours to pass from there to the splenic flexure, from whence the feces are moved slowly to the sigmoid flexure. The rectum is probably empty until just before defecation, and the entrance of feces into the rectum probably excites the desire. The rectum is closed by the internal and external sphincters, the latter being partly under the control of the will. Defecation is partly a voluntary and partly an involuntary action.

The digestion of food takes place through a number of chemical changes brought about in the alimentary tract by the action of certain unorganized ferments usually known as enzymes. Along with these chemical changes there are, of course, alterations in the physical properties of the food, the two combined allowing the useful part to be assimilated, while the remainder passes off as refuse.

Enzymes.—An enzyme is a substance, produced by living cells, which acts by catalysis. They are complex nitrogenous substances which act specifically, the exact chemical nature of which is unknown. Howell makes the following classification:

1. **The Proteolytic or Protein-splitting Enzymes.**—Examples: Pepsin of gastric juice, trypsin of pancreatic juice. They cause a hydrolytic cleavage of the protein molecule.

2. **The Amylolytic or Starch-splitting Enzymes.**—Examples: Ptyalin or salivary diastase, amylase, or pancreatic diastase. Their action is closely similar to that of the classical enzyme of this group—diastase—found in germinating barley grains. They cause a hydrolytic cleavage of the starch molecule.

3. **The Lipolytic or Fat-splitting Enzymes.**—Example: The lipase found in the pancreatic secretion, in the liver, connective tissues, blood, etc. They cause a hydrolytic cleavage of the fat molecule.

4. **The Sugar-splitting Enzymes.**—These again fall into two subgroups: (*a*) The inverting enzymes, which convert the double sugars or disaccharids into the monosaccharids. Examples: Maltase, which splits maltose to dextrose; invertase, which splits cane sugar to dextrose and levulose; and lactase, which splits milk sugar (lactose) to dextrose and galactose. (*b*) The enzymes, which split the monosaccharids. There is evidence of the presence in the tissues of an enzyme or enzymes capable of splitting the sugar of the blood and tissues (dextrose) into lactic acid.

5. The **Coagulating Enzymes,** which convert soluble to insoluble proteins. Example: The coagulation of the casein of milk by rennin.

6. **The Oxidizing Enzymes or Oxidases.**—A group of enzymes which set up oxidation processes. Some of the details of the activity of these enzymes are considered in the discussion of physiological oxidations.

7. The **Deaminizing Enzymes,** which by hydrolytic cleavage split off an NH_2 group as ammonia. Thus alanin (aminopropionic acid) by hydrolysis loses its NH_2 group as ammonia and passes into lactic acid.

8. **Protective Enzymes.**—Experimental work in recent years has brought out the interesting and important fact that when foreign proteins, carbohydrates, or fats are introduced into the blood of an animal, corresponding enzymes are formed which are adapted to break down the foreign material by a process of digestion.

Enzymes have certain properties in common. They are, for example, soluble in water, salt solution, and glycerin. They are destroyed at a temperature of from 60° to 80° C., and their action is retarded or entirely suspended by low temperatures—*e. g.*, by freezing—without, however, actually destroying the enzyme. They are characterized further by the fact that after a certain degree of change has been effected the products of their activity prevent further action, so that most of them may be said to be incomplete in this respect. Most enzymes show an optimum activity at temperatures approximating that of the body.

Another curious fact is that the activity of an enzyme is not in proportion to the amount present. A trifling quantity may effect enormous change, and increasing the amount of enzyme augments the change produced, but only to a certain point, after which the action is the same whether much or little be added. An enzyme cannot be

CLASSIFICATION OF ENZYMES *(According to Hawk)*.

Name and Class.	Distribution.	Substrate.	End-products.
Carbohydrases:		Carbohydrates.	
1. Amylases:		Starch, dextrin, etc.	
(*a*) Pancreatic (amylopsin).	Pancreatic juice.	Starch, dextrin, etc.	Maltose.
(*b*) Salivary (ptyalin).	Saliva.	Starch, dextrin, etc.	Maltose.
(*c*) Vegetable.	Malt, rice fungus, etc.	Starch, dextrin, etc.	Maltose.
2. Glycogenase.	Liver, muscles (?).	Glycogen.	Dextrin and maltose (glucose).
3. Inulase.	Fungi, other plants.	Inulin.	Fructose.
4. Lactase.	Intestinal juice and mucosa.	Lactose.	Glucose and galactose.
5. Maltase.	Blood-serum, liver, saliva, pancreatic and intestinal juices, and lymph.	Maltose.	Glucose.
6. Sucrase (invertase).	Intestinal juice and mucosa.	Sucrose.	Glucose and fructose.
7. Zymase.	Yeast.	Sugars.	Alcohol, CO_2, etc.
Carboxylase:	Yeast.	COOH group of aliphatic acids.	Carbon Dioxide.
Deaminases:		Amino compounds.	
1. Adenase.	Animal tissues.	Adenine.	Hypoxanthine.
2. Arginase.	Intestine, liver, kidney, spleen, etc.	Arginine.	Ornithine and urea.
3. Guanase.	Animal tissues.	Guanine.	Xanthine.
4. Urease.	Micrococcus ureæ, soy bean, etc.	Urea.	Carbon dioxide and ammonia.
Glucosidases:		Glucosides (amygdalin and others).	
1. Emulsin.	Plants.	(α) Glucosides.	Glucose, etc.
2. Invertase.	Yeast, etc.	(β) Glucosides.	Glucose, etc.
Lipases:		Fats.	
1. Autolytic.	Animal tissues.	Fats.	Fatty acid and glycerol.
2. Pancreatic (steapsin).	Pancreatic juice.	Fats.	Fatty acid and glycerol.
3. Vegetable.	Castor bean, etc.	Fats.	Fatty acid and glycerol.

Nucleases:		Nucleic acid and derivatives.	
1. Nucleicacidase.	Intestinal mucosa and juice, other tissues.	Nucleic acid.	Nucleotides.
2. Nucleotidase.	Intestinal mucosa and juice, other tissues.	Nucleotides.	Phosphoric acid and nucleosides.
3. Nucleosidase.	Tissues.	Nucleosides.	Carbohydrate and bases.
Oxidases:			
1. Catalase.	Plant and animal tissues.	Hydrogen peroxide.	Oxygen or oxidation products.
2. Laccase.	Lac tree, fungi, etc.	Polyhydric paraphenols as hydrolquinol and pyrogallol.	Oxidation products.
3. Perixodase.	Plant and animal tissues.	Organic peroxides.	Oxygen or ozidation products.
4. Purine-oxidases:		Purines.	
(a) Hypoxanthine oxidase.	Animal tissues.	Hypoxanthine.	Xanthine.
(b) Uricase.	Animal tissues.	Uric acid.	Allantoin.
(c) Xanthine oxidase.	Animal tissues.	Xanthine.	Uric acid.
5. Tryosinase.	Plant and animal tissues.	Tryosine.	Homogentisic acid, etc.
Peptases:		Polypeptids.	
1. Erepsin.	Intestinal mucosa and juice, other tissues.	Peptids, also peptones and casein.	Simpler peptids and amino-acids.
Phytase.	Rice bran, liver, blood.	Phytin.	Inositol and phosphoric acid.
Proteases:		Proteins.	
1. Coagulases:		Proteins in solution.	
(a) Rennin (gastric).	Gastric juice.	Casein.	Paracasein.
(b) Rennin (pancreatic).	Pancreatic juice.	Casein.	Paracasein.
(c) Thrombin.	Blood.	Fibrinogen.	Fibrin.
2. Pepsin (acid-protease).	Gastric juice.	Proteins.	Proteoses, peptones, and peptides.
3. Trypsin (alkali-protease).	Pancreatic juice.	Proteins.	Proteoses, peptones, peptides, amino-acids.
4. Vegetable proteases:			
(a) Bromelin.	Pineapple.	Proteins.	Proteoses, peptones, etc.
(b) Papain (papayotin).	Pawpaw.	Proteins.	Proteoses, peptones, etc.
Purinases (see Purine Oxidases and Purine Deaminases).			

used over and over again, as it is altered in some way and so rendered incapable of indefinite action. The phenomenon known as adsorption undoubtedly plays an important part in the action of enzymes.

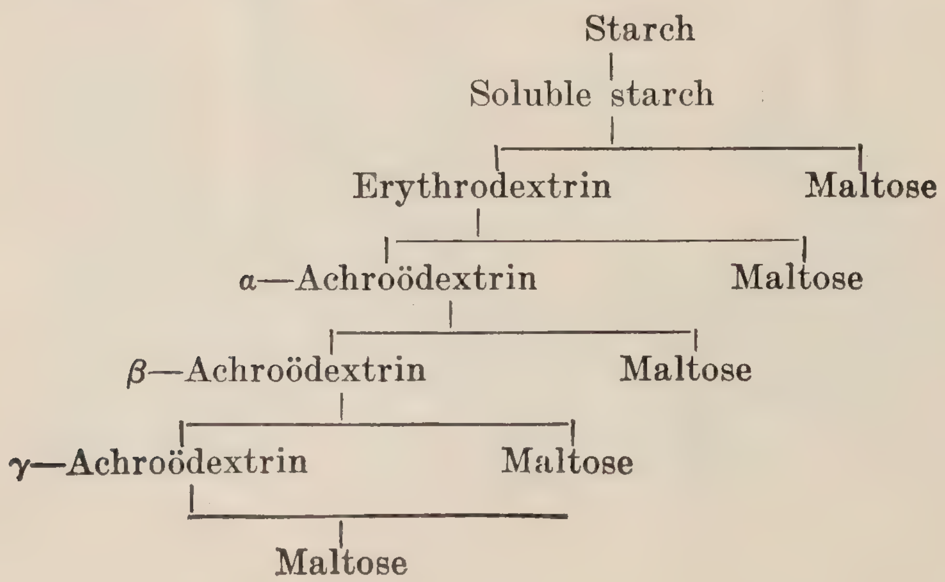
It is commonly believed that enzymes effect many of their changes by hydrolysis, that is, they cause the substance acted upon to take up one or more molecules of water, the result being that the complex body separates into two simpler ones. Take, for example, the familiar example of the change in cane sugar:

$$\underset{\text{Cane sugar.}}{C_{12}H_{22}O_{11}} + H_2O = \underset{\text{Dextrose.}}{C_6H_{12}O_6} + \underset{\text{Levulose.}}{C_6H_{12}O_6}$$

With this preliminary consideration of the enzymes we may now proceed to the study of digestion.

Salivary Digestion.—When food is taken into the mouth and masticated there is a reflex stimulation of the secretory nerves, initiated by mechanical and chemical stimuli. This results in a flow of saliva, which is the combined secretion of the parotid, submaxillary, and sublingual glands, together with that of the mucous glands of the mouth. It is usually colorless, ropy, and stringy, due to the presence of mucin, of a slightly acid or neutral reaction, and has a specific gravity of 1.003. It acts in alkaline, neutral, or combined acid solutions. The digestive ferment which it contains is called salivary amylase or ptyalin. Saliva softens the food, acts as a lubricant, and hydrolizes part of the cooked starch. The thorough moistening of the food ensures it being easily swallowed. There is little salivary digestion in the mouth, owing to the brief time the food remains there, but in the stomach, especially in the fundic end, salivary digestion proceeds until the increasing acidity puts an end to it. The moistening of the food during mastication brings about the solution of soluble particles and enables it to be tasted. Thus is produced the chemical stimulation to the salivary glands. In addition to the stimuli mentioned above, psychical stimuli and the sight of food will produce a flow of saliva.

Ptyalin acts upon starches by a process of hydrolytic cleavage, converting them finally into a disaccharid—maltose. The following scheme is most generally accepted:



The presence of starch is evidenced by its blue color when brought in contact with iodin, erythrodextrin red, and with achroodextrin there is no color reaction.

Until recent years it was thought that the digestion of starches in the stomach was quite insignificant, because of the fact that acid not only inhibits, but destroys ptyalin. Since the *x*-ray work of such investigators as Cannon and Herz[1] we know this conception to be erroneous, as they have shown the layer formation of food as it enters the stomach, whereby the last to be received is protected from the acid secretion of the fundic portion, thus delaying for a considerable time the contact of acid with ptyalin, and, therefore, salivary digestion is carried on to a considerable degree before being interfered with by the gastric juice. Raw starch is acted upon very slowly, whereas in well-cooked starch sugar may be detected after even one minute. This is due to the fact that the starch granules are surrounded by an envelope of vegetable fiber (cellulose) that protects it from the action of the ferment. On boiling, this cellulose covering is broken, and the starch is not only liberated but also takes up water, rendering it easy of digestion. (See section on Cooking.)

Gastric Digestion.—We are indebted to Pawlow for a great amount of pioneer work concerning the nature of digestive processes. It was he who established the fact of psychic secretion, which we now know to be a most important factor in digestion. The first stimulus of gastric secretion originates in the mouth, and this causes the first flow of gastric juice, when the furtherance of the flow depends upon the action of what we know as secretagogues. Some foods contain substances that have the power to cause secretion of gastric juice when taken into the stomach; for example, meat extract and meat juices. This element is present to a much less extent in milk, while bread and white of egg have practically no effect at all.

Howell gives three steps in the mechanism of secretion: (1) Psychical secretion; (2) secretion from secretagogues contained in the food; (3) the secretion from secretagogues contained in the products of digestion.

Edkins is of the opinion that the secretagogues, whether present in the food or formed during digestion, act upon the pyloric mucous membrane and form a substance which he designates as gastric secretin, and this substance after absorption into the blood is carried to the gastric glands and stimulates them to secretion.

Various foods produce gastric secretions of varying digestive qualities; for instance, that produced by bread is less in quantity but of greater digestive power than that produced by meat. The juice produced by psychic stimulation is always of the same quality.

Gastric juice is a thin, colorless, strongly acid liquid, with a specific gravity of about 1.002. Its most important constituents are hydrochloric acid, pepsin, rennin, and lipase.

[1] Herz changed his name to Hurst during the war.

Pepsin is a proteolytic enzyme acting only in acid media. It is present in the cells as a zymogen, and is not changed to the active pepsin until after secretion. The process of peptic digestion is probably as follows:

Protein
|
Acid albumin
|
Primary proteose
|
Secondary proteose —— Amino-acid
|
Peptone —— Amino-acid

The whole process seems to be one of hydrolytic cleavage of the protein molecule, with peptone as the final stages as far as gastric digestion is concerned. All changes wrought by the digestive ferments on the food-stuffs are hydrolytic.

Rennin is the enzyme of the gastric juice which has to do with curdling of milk. It is present in the cells of the gastric tubules in the form of a zymogen, being converted into an active enzyme in the presence of acid. The action upon human milk causes the formation of loose flocculi, while the curd formed by its action on cow's milk is more solid and of finer consistency.

Fats undergo simply a physical change in the stomach, the chemical action upon them being effected by the intestinal juices.

Intestinal Digestion.—When the food has been passed into the small intestine, it is acted on simultaneously by three secretions—the pancreatic juice, the intestinal juice, and the bile. Although these secretions, as stated, act together, for the sake of simplicity each will be considered separately.

Pancreatic Juice.—Our knowledge of the functions of the pancreatic juice is obtained largely from experiments made on the lower animals. In man it enters the intestine together with or closely following or preceding the bile, being mixed with the latter secretion and the food material at the same time. It is alkaline in reaction, and contains at least three, and probably more, enzymes, viz., trypsin, amylase, steapsin, or lipase, and, it is said, a milk-curdling ferment similar to rennin.

According to Pawlow, the amounts of the various ferments in the pancreatic juice vary with the nature of the food taken, starchy food causing an increase in the amylase, and so forth. These statements have not been fully confirmed as yet by other observers. Pawlow has also shown that the presence of bile doubles the activity of the digestive juices.

Trypsin is a more active ferment than pepsin, and acts in alkaline, neutral, or even in slightly acid media. It is most active, however, in alkaline solutions. The process by which peptones are formed from proteins is similar to that of peptic digestion, but differs somewhat

in detail. Trypsin, however, is capable of carrying on the digestion of peptones further than pepsin. The steps in the hydrolysis of the protein molecule by trypsin have been the subject of a very great amount of study. The trypsin, like the pepsin, hydrolyzes the simple proteins first to a proteose, and then to a peptone stage, but the latter product may be split still further into a variety of simpler bodies, the number and character of which depend on the amount of trypsin and the time that it acts. The actual products formed depend on the length of time the trypsin is allowed to act and the conditions, favorable or unfavorable, under which it acts. The end-products formed are amino-acids.

Amylase converts starch, by hydrolysis, into maltose in the same way that ptyalin does. Before absorption the substances are further acted upon by the maltase of the intestinal secretion and converted to dextrose. It is important that the starches should be completely digested in the small intestine, especially as a large part of the heat and energy consumed by the body is derived from some form of starchy food.

Steapsin, known also as lipase, splits up the neutral fats into glycerin and free fatty acids. This emulsification is of paramount importance in fat digestion and absorption. The process now becomes again one of hydrolysis. The fat takes up water and splits up into other products. The following formula explains the process:

$$\underset{\text{Fat.}}{C_3H_5(CH_{2n}+{}_1COO)_3} + 3H_2\ O = \underset{\text{Glycerin.}}{C_3H_5(OH)_3} + \underset{\text{Free fatty acid.}}{3(C_nH2_{n6}+{}_1COOH)}$$

There are two views concerning the absorption of fat. The older view is that the fat splits or is saponified only to a small extent, the larger part of it being emulsified fat is then directly absorbed as neutral fat. The view more recently adopted is that all the fat is split up into glycerin and fatty acids, whether or not emulsification has previously occurred. The fatty acids are saponified by the action of the alkaline salts in the intestine, the products being then absorbed and brought into combination again to form a neutral fat. This recombination may occur in the epithelial cells of the intestine. The action of lipase is reversible, that is, may split up the fats or it may cause synthesis of the split products. Lipase is found in many tissues of the body, as liver, muscle, and mammary glands. It is possible that fat is split and re-formed many times in the processes of nutrition. In the digestion of fats, the lipolytic enzyme, lipase, is aided by the bile salts, sodium glycocholate and sodium taurocholate, which are necessary for the completion of the reaction.

Intestinal Secretion.—This is the secretion of the intestinal glands, the crypts of Lieberkühn. It is strongly alkaline from the presence of sodium carbonate. The secretion and the walls of the small intestine contain three ferments which act upon carbohydrates. These

are invertase, which acts upon cane sugar; maltase, which acts upon maltose, and lactase, which acts upon lactose. The walls of the intestines contain also erepsin and enterokinase. Erepsin probably continues or supplements the change begun by trypsin. This enzyme acts especially upon the proteoses and peptones, causing complete hydrolysis. The digestion of the protein begun by the pepsin or the trypsin is carried to completion by the action of the erepsin. Erepsin has been found by Vernon in all the tissues of the body. It is present in the kidneys in greater quantities than in the intestinal mucosa. Enterokinase activates inactive trypsinogen to trypsin. When the acid chyme comes in contact with the duodenal mucosa, a substance, *pancreatic secretin,* is formed, which, carried by the blood, acts as a hormone on the pancreas, stimulating it to activity. The trypsin, produced under these conditions, is in an inert form, trypsinogen, which must be activated by the enterokinase of the duodenum before it can effect hydrolysis of the proteins.

Bacterial Changes.—The changes produced by bacteria are an extremely important factor in digestion, especially from the pathological standpoint. The subject cannot, however, be entered upon fully here, and for a complete knowledge the student should consult the special text-books on bacteriology. For our present purpose it is sufficient to say that, in the small intestine, bacterial changes are probably limited to the carbohydrates. Under abnormal conditions, or when excessive quantities of protein food are taken, putrefaction of the proteins may occur. In the large intestine, however, the extreme alkalinity overcomes this acidity, and allows putrefaction of the feces to take place. The products of bacterial action are many, and consist of leucin, tyrosin, phenol, skatol, and various acids and gases. Some of these, after having undergone certain changes, are absorbed and excreted again in the urine. It is not definitely known just what part they play in the nutrition of the body. Judging from the experiments of Nuttall, it is reasonably certain, however, that bacterial action is not essential to nutrition.

Liver.—The liver plays an important part in the nutrition of the body. This importance is due in part to the bile which it excretes, and to the action of the liver cells on material borne to them by the portal and arterial circulation. Bile is at once a secretion, an adjuvant to intestinal digestion, and an excretion.

The *bile* contains water, inorganic salts, bile-pigments, bile acids (glycocholic and taurocholic), cholesterol, lecithin, fats and soaps, a trace of urea, and a mucilaginous nucleoprotein.

The *bile-pigments* are part of the end-products of the destruction of the hemoglobin of the hemolyzed and disintegrated red cells. The *bile acids* aid in dissolving the cholesterol, assist in the hydrolysis of the fats, and by absorption serve as cholagogues. *Cholesterol* is a waste product of various tissues, and is excreted by the liver cells, as

well as by the skin glands and the mammary glands. Lecithin is also an excretory product. Bile has very feeble antiseptic properties. When the supply of bile is excluded from the intestines a large amount of the fat is found in an undigested form in the feces.

PECULIARITIES OF THE DIGESTION IN INFANTS

Salivary Glands.—The reaction of the newborn baby is neutral or faintly alkaline, but in older babies the reaction is acid, evidently due to the decomposition of the food remaining in the mouth. Saliva is secreted early in the first week and is active, but is probably not a very important feature of digestion. After six months of age the addition of starchy foods increases the activity and quantity of the saliva.

The Stomach.—In the fetus the stomach is vertical, but by birth it is nearly transverse. It has no definite size or shape, but this varies as shown by Roentgen ray examinations, with its contents, the amount of gas present and the position of the child. The size of the stomach is apparently very variable. Holt gives the following table of the capacity of the stomach as determined postmortem.

Age.	Number of cases.	Average capacity.
Birth	5	1.20 ounces
2 weeks	7	1.50 "
4 "	4	2.00 "
6 "	11	2.27 "
8 "	4	3.37 "
10 "	2	4.25 "
12 "	6	4.50 "
14–18 weeks	12	5.00 "
5–6 months	14	5.75 "
7–8 "	9	6.88 "
10–11 "	7	8.14 "
12–14 "	10	8.90 "

As soon as the child begins to take food the stomach begins to empty itself, so that some of it passes into the intestines, enabling the baby to take more food at a feeding than would be indicated by the stomach measurements. The length of time the food remains in the stomach varies greatly. This subject has been studied by test-meals and the Roentgen ray. The breast-fed baby probably empties the stomach in from one to two hours, and a little longer for the older ones. The size of the meal and character of the food may increase the length of time and cow's milk may remain in the stomach three hours or more. In mixed feeding the carbohydrates, not requiring stomach digestion, pass out first, the proteins next, and the fats last of all. If a second feeding is given before the stomach is empty the first meal is hurried along. The more dilute and fluid the food, the more rapidly the stomach is emptied.

The cardiac end of the stomach seems to be used largely to hold the food, and from there it is passed to the pyloric end, where it is

more actively mixed. The pyloric valve opens and shuts from time to time, allowing the food to pass, and this seems to depend largely on the reaction on the duodenal side, an acid reaction closing the valve, an alkaline one allowing it to open. When the food is made acid or alkaline it remains longer in the stomach.

The Secretions.—Pepsin is present in the stomach at birth, and later is more abundant in the artificially fed than the breast fed. It also seems to vary in healthy infants more according to the age than the weight. In digestive disturbances it may be absent. Rennin plays an important part in infant digestion, and it coagulates mother's milk in loose flakes, whereas cow's milk is coagulated in large curds. This fact should be borne in mind in feeding cow's milk to young infants, and the milk should be so modified as to prevent curdling in large masses. The reaction of the stomach is acid due to the presence of hydrochloric acid, and in children fed on cow's milk lactic acid may be demonstrated. This is formed by the action of bacteria or secretions in the food. The action of alkalies on the acid of the stomach is not perfectly clear and there are conflicting opinions on this point. A fat-splitting ferment, lipase, is found at an early age and increases as the baby gets older.

Absorptions of glucose solutions and proteins may occur, but water is not absorbed from the stomach. Various drugs, such as iodine, may be absorbed directly.

Intestinal digestion depends on certain ferments, erepsin, which acts on the proteins, invertase, lactase, and maltase. The bile splits fat and activates the pancreas. The pancreas secretion contains three ferments: trypsin, that splits protein; steapsin, which splits neutral fats into glycerin and fatty acids, and amylopsin, which acts on starch, converting it to sugar. The pancreatic digestion is not as active as later, but trypsin and steapsin have been demonstrated at birth or near it. The intestine produces secretin which has been found at birth. This acts through the circulation activating the pancreas. Enterokinase has also been demonstrated in the newborn.

TOBACCO AND DIGESTION

Tobacco frequently plays an important rôle in influencing the digestion of food. It is a well-known fact that the chewing of tobacco increases the salivary secretion, frequently reduces the appetite, and increases the movements of the bowels. As a rule, it is better to smoke after meals than before, the irritating effect of tobacco being thus lessened. In acute gastric disturbances tobacco should be interdicted freely, and in chronic forms the smoking should be limited to a very few cigars a day.

Tobacco acts as an excitant to the nervous system, and should be prohibited in all nervous diseases.

ABSORPTION

In order properly to understand digestion and assimilation it is necessary to know something of absorption. This occurs in two ways: either by the material absorbed entering directly into the blood and passing thence to the liver, or by its entering the lacteals and passing thence through the thoracic duct to enter the blood-current of the left jugular and subclavian veins.

Absorption was formerly believed to take place to a very marked extent in the stomach. This view is now held to be erroneous, probably little or no absorption taking place in this organ. Water, as well as most other liquids, may be absorbed slightly from the stomach. Alcohol may be absorbed in it, and solutions of various salts may be absorbed slowly. Condiments, by stimulating the mucous membrane of the stomach and increasing the secretion of gastric juice, aid in stomach absorption. Fats are not absorbed by the stomach. Proteins and sugars, if taken in sufficiently concentrated solutions, may be absorbed, the congestion brought about by the use of alcohol or condiments aiding the absorption. On the whole, however, absorption from the stomach is of trifling importance.

Absorption in the Intestine.—Absorption takes place principally in the small intestine. Food passes from the small intestine in from five to twenty hours. On entering the large intestine the food is still in a very fluid condition, notwithstanding the large amount of absorption of water and salts that takes place during its passage through the small intestine.

The absorption of water is a special function of the intestinal epithelium, and not a simple question of osmosis. Solutions of the same concentration as the blood-plasma may rapidly be absorbed. The water absorbed is taken up directly by the capillaries, without first passing through the lacteals, although if very large quantities are taken, this last may occur. Our knowledge of intestinal absorption is due largely to the experiments of Heidenhain.

The water absorbed is largely replaced by the abundant secretion of the small intestine.

The protein food is absorbed as amino-acids which enter the blood-stream and circulate in it as such to be utilized in building up and repairing the tissues. The excesses are deaminized in the liver. (See Amino-acids.)

The carbohydrates are absorbed as dextrose or as levulose. Dextrose can be demonstrated in the blood, and if solutions of this substance are injected directly into the circulation, it may be utilized by the tissues. The absorption of dextrose from the intestine is probably more than a simple process of diffusion through an animal membrane, and it is possible that a special activity of the intestine is here brought into play.

The fats are absorbed as fatty acids. The fatty acids are changed

into neutral fats, a process that probably takes place in the epithelial cells of the intestine. The fats pass for the most part directly into the lacteals and into the blood by way of the thoracic duct.

Absorption takes place in the large intestines, but it is chiefly an absorption of water. The feces enter into a very liquid condition, and, after making slow progress for almost twelve hours, they reach the rectum in an almost solid condition. The large intestine possesses remarkable powers of absorption, since peptonized milk, and the like, given in the form of nutrient enemata or experimentally, may be absorbed into the system.

In determining the degree of absorbability of food the amount of the elementary food principles ingested must first be ascertained, and the proportion that has not been absorbed determined from the feces. The degree of absorbability of a food indicates, in a measure, its nutritive value. According to Atwater,[1] from an ordinary mixed meal an average of 92 per cent. of protein, 95 per cent. of fats, and 97 per cent. of carbohydrates are absorbed in the body. "The proportion of the several nutrients which the body retains for its use are commonly called percentages or coefficients of digestibility." The following table, taken from Atwater, gives these coefficients of digestibility:

Coefficients of Digestibility and Fuel-value per Pound of Nutrients in Different Groups of Food-materials.

Kind of food.	Protein.		Fat.		Carbohydrates.	
	Digestibility.	Fuel-value per pound.	Digestibility.	Fuel-value per pound.	Digestibility.	Fuel-value per pound.
	Per cent.	*Calories.*	*Per cent.*	*Calories.*	*Per cent.*	*Calories.*
Meats and fish	97	1940	95	4040	98	1730
Eggs	97	1980	95	4090	98	1730
Dairy products	97	1940	95	3990	98	1730
Animal food (of mixed diet)	97	1940	95	4050	98	1730
Cereals	85	1750	90	3800	98	1860
Legumes (dried)	78	1570	90	3800	97	1840
Sugars	..	...	..	...	98	1750
Starches	..	...	..	...	98	1860
Vegetables	83	1410	90	3800	95	1800
Fruits	85	1520	90	3890	90	1630
Vegetable foods (of mixed diet)	84	1840	90	3800	97	1820
Total food (of mixed diet)	92	1820	95	4050	97	1820

Rubner[2] gives the following table, showing the absorbability of various foods:

[1] Principles of Nutrition and Nutritive Value of Food, Farmers' Bulletin No. 142, United States Department of Agriculture.

[2] *Zeitschr. f. Biol.*, vol. xv., p. 115.

Food-stuffs.	Weight of same in grams.		Absorbed in percentage of				
	Fresh.	Dried.	Dried substance.	Albumin.	Fat.	Carbo-hydrates.	Ash.
Meat	884	376	95	97	95	. .	82
Eggs	984	247	95	97	95	. .	82
Milk	2470	315	92	94–99	95–97	100	51
Milk and cheese	2490	420	94	96	97	100	74
White bread. .	860	753	95	81	. .	99	93
Black bread . .	1360	765	85	68	. .	89	64
Macaroni . . .	695	626	96	83	94	99	76
Indian corn . .	750	646	93	85	83	97	70
Corn and cheese	. .	780	96	93	91	96	81
Rice	638	552	96	80	93	99	85
Peas	600	521	91	83	93	96	68
Potatoes . . .	3078	819	91	68	96	92	84
Cabbage . . .	3830	406	85	82	94	85	81
Carrots	2566	352	79	61	94	82	76

The Absorption of Protein.—It has been estimated that about 80 per cent. of the protein is absorbed in the small intestine and 14 per cent. in the large intestine. The proteins of animal food are much more completely absorbed than those in vegetable foods. Meat, for example, is very completely absorbed, about 97 per cent., and there is very little residue left in the bowel. The same is true of fish and eggs, which are absorbed up to about 95 per cent.

Milk is absorbed better in children than in adults, there being about 4 per cent. residue in the former to 10 per cent. in the latter. When milk is mixed with other foods it is much more completely absorbed, in fact, almost entirely.

The reason why vegetable proteins are not completely absorbed is not clear, but the fact remains that the percentage of residue is very high. In potatoes 32 per cent. is left, while in carrots, beans, and lentils about 40 per cent. is left.

Absorption of Fats.—These are very completely absorbed if not given in excessive quantities. Fat contained in vegetable foods seems to be entirely absorbed. The lower the melting-point, the greater the amount of absorption. Hutchison has placed the limit of the capabilities of absorption of fat of the ordinary individual at 150 grams a day, but there are wide individual peculiarities. Some persons cannot utilize much fat, and it causes diarrhea or other intestinal disturbances if given in excessive quantities. The excess is passed in the feces. The Esquimaux can utilize large quantities of fat, while in the tropics but little is taken.

Absorption of Carbohydrates.—Carbohydrates are absorbed more completely than either fats or protein. Sugar is completely absorbed, and starch too, unless given in certain forms. Under ordinary circumstances they leave little or no residue in the intestine.

The Absorption of Vegetable Foods.—These leave more or less residue, according to the amount of cellulose and fiber they contain. Some cereals, as rice, are nearly completely absorbed, only about 19 per cent. of the protein being left. Oatmeal, on the other hand, leaves considerable residue. The legumes as ordinarily given leave a considerable residue, but if given in finely divided forms, as in legume flours, they are fairly well absorbed. Roots and tubers leave a considerable residue, according to the amount of cellulose contained. Potatoes are absorbed very completely.

Green vegetables and fruits leave considerable residue. Some green vegetables, as cabbage, contain but little nutriment.

Digestibility of Vegetable Fats.—Langworthy and Holmes have studied the digestibility of some of the vegetable fats and find that, with allowance for metabolic products, the coefficients of digestibility have been found to be for olive oil 97.8; for cottonseed oil 97.8; for peanut oil 98.3; for cocoanut oil 97.9; for sesame oil 98; for cocoa butter 94.9. These figures show that with the exception of cocoa butter all these oils have essentially the same coefficient of digestibility and about equal the animal fats in this respect. The melting-point of these fats is considerably below that of the human body, and with the exception of cocoa butter they are very well utilized by the body. The digestibility of the protein and carbohydrate contained in the different fat diets was not materially affected by the amount or nature of the fat.

Absorption in Mixed Diet.—This is better than when the various kinds of foods are given alone. Atwater has shown that the following proportions of the alimentary principles are absorbed when the individual takes a mixed diet:

	Protein.	Fats.	Carbohydrates.
Animal foods	98 per cent.	97 per cent.	100 per cent.
Cereals and sugars	85 "	96 "	98 "
Vegetables and fruits ..	80 "	90 "	95 "

Practical Value of Absorbability in Diets.—On an ordinary mixed diet there is sufficient residue to form normal feces. When there is diarrhea or intestinal disturbances the foods chosen should be those which are as completely absorbed as possible. On the other hand, when there is constipation, foods having a considerable residue are valuable, so that fruits and green vegetables and the roots and tubers containing a considerable amount of cellulose and fiber should be chosen.

THE INFLUENCE OF VARIOUS FACTORS UPON THE DIGESTION

The digestibility of a food is important. No matter what its value in calories or its protein or other content, if the individual who eats it cannot digest the meal, it is of little value. In dealing with the sick this is of especial importance. In arranging a diet this must always be taken into consideration.

Apart from the selection of a proper diet, important factors that especially affect the digestion are the following: 1. The hours, order and frequency of meals. 2. Variety in diet. 3. The appetite. 4. The temperature of food. 5. Rest and exercise before and after meals. 6. Emotion.

1. Order and Frequency of Meals.—It is usually customary to fix certain hours for the taking of meals; these hours vary with the occupation of the individual. In large cities, where the noon hour is taken up largely with active business pursuits, evening is selected as the most convenient hour for dinner. Sir Henry Thompson states that three general systems are in use according to which two, three or four meals are taken daily. The first system, which consists of two meals a day, is followed in France and other countries on the continent of Europe. A substantial meal, consisting of fish or meat and other courses of solid foods, is eaten about noon; no food is taken before the noon meal, except on arising, when a cup of coffee or chocolate and a small quantity of bread and butter are taken. The second meal, which is dinner, is eaten between 6 and 7 o'clock in the evening. This meal is the largest meal of the day, and consists of soup, fish, meat, vegetables, salads, dessert, and black coffee. The second system, commonly in vogue in England, consists of four meals daily. The first meal, or breakfast, is taken at about 8 A. M., and consists of cocoa, tea, or coffee, bread, butter, bacon, fish, or eggs; dinner is eaten between 1 and 2, and consists of soup, meat, fish, vegetables, and pudding; tea is taken at 5 P. M., and supper is served at 8, and consists of meat, fish, vegetables, and stewed fruits. Dinner is taken in the evening by the well-to-do classes, and a substantial lunch is usually taken at noon. The third system, practised in the United States, consists in taking three meals daily. In many towns it is customary to dine at noon; in others, in the evening. The usual breakfast, taken between 7 and 8 A. M., consists of fruits, breakfast food or cereals, eggs, bacon, or salt fish, tea, cocoa or coffee, and bread and butter. Luncheon, eaten between 12.30 and 2 o'clock, consists of cold meat or a chop, vegetables, salads, and dessert. Dinner, eaten between 6.30 and 8 P. M., is the heaviest meal of the day, and consists of soup, fish, meats, vegetables, salads, and fruit.

The conventional order of taking food at dinner appears to be most rational, namely, soup, fish, entrée, meat, vegetables, salads, fruits.

Small quantities of soup stimulate the gastric secretion, do not interfere with digestion, and pass rapidly from the stomach; the fish and entrée are then partaken of, before the acidity of the gastric secretion has reached its height; next follows the meat, the stomach now secreting liberal quantities of gastric juice wherewith to carry on the digestive processes; finally come the carbohydrates, which do not undergo digestion in the stomach, and which enter this organ when the food already taken is about to pass from the stomach into the intestine. The eating of bountiful dinners, made up of many courses, when frequently indulged in, is likely to lead to digestive disturbances. Children and invalids should always eat dinner at midday, between 12 and 2 o'clock, and should never be allowed to take this meal at night.

The *frequency of meals* must be regulated according to individual conditions. Patients suffering from digestive disturbances and those who take very small quantities of food at a time require nourishment at frequent and regular intervals; whereas those whose digestion is feeble, should allow six or seven hours to elapse between meals; ordinarily the interval between meals should be about four or five hours, this being about the time necessary for complete digestion of a mixed meal in the stomach. The habit of habitually omitting the noon luncheon, so commonly practised by busy Americans, should be discouraged.

2. Variety in Diet.—In order thoroughly to satisfy the needs of the body the diet must be varied. Although a diet restricted to but a few articles of food may contain a sufficient quantity of the alimentary principles to sustain the body nutrition, yet the monotony of such a diet becomes so objectionable that it can not be digested thoroughly. According to Woods and Merrill,[1] "it is a matter of common observation that digestion experiments made with one kind of food-material do not give on the whole as reliable results as those in which two or more food-materials are used. In other words, it appears that with a mixed diet the same person will digest a larger proportion of nutrients than with a diet composed of a single food-material." Certain races restrict the variety of food from religious motives, such as the Jewish restriction of ham, pork, and oysters. (See Leviticus, chapter xi.)

3. Appetite.—Appetite is the desire for food, and is dependent upon various conditions. It is controlled by the sensation of hunger, and is often induced by the sight, smell and taste of food. As Pawlow has shown,[2] the smell or sight of food will excite the flow of the gastric secretion, and this in turn will produce an appetite. Simple bitters or some form of alcoholic drink will at times induce this sensation. The appearance of badly prepared or improperly served food will often dispel the appetite. In children the appetite is usually good, whereas in the aged it is lessened. Some persons have voracious appe-

[1] United States Department of Agriculture Bulletin No. 85.
[2] The Work of the Digestive Glands.

tites, and abnormal craving for food. This is often the case in diabetic and other conditions, when, at times, the appetite can not be satisfied.

4. **Temperature of Food.**—The temperature of food when taken is of considerable importance. The ideal temperature is that of the body, from 98° to 100° F. (Uffelmann), the limits of safety being between 45° and 130° F. According to Hutchison, extremes of temperature of food are apt to give rise to gastric disturbances, such as gastric catarrh. Uffelmann states that a drink at a temperature of 122° F. increases the body-temperature 0.1 to 0.3 degree C. It is believed by many that ulcer of the stomach, so common in cooks, is often due to the taking of too hot foods. Hutchison considers that the proper temperature of water intended to quench the thirst should be between 50° and 70° F.

5. **Rest and Exercise before and after Meals.**—It is often advisable to rest, but not to sleep, after meals. The larger part of the work of the stomach should be completed before retiring at night, otherwise the sleep is apt to be disturbed. About one or two hours should be allowed to elapse between a light evening meal and bedtime, and three or four hours between a heavy meal and sleep. From personal observations (see the section on Rest and Sleep in Gastric Disturbances) the authors have concluded that digestion is improved by rest after meals, but impaired by sleep. In many instances a period of rest before eating meals is a valuable aid to digestion. Violent exercise immediately after meals inhibits digestion, whereas moderate exercise one or two hours after meals materially aids this process.

6. **Food and Emotion.**—Severe mental strain and strong emotion disturb the digestion, and for this reason food should not be taken until a period of rest and composure has intervened. On the other hand, pleasurable sensations aid the digestion, and pleasant conversation at the table is therefore to be recommended.

METABOLISM

Food is required for two purposes: to build up the body and repair tissue-waste, and to supply energy and heat.

For purposes of study food may be classified into proteins, fat, carbohydrates, mineral salts, vitamins, and water. These are more or less complex combinations of the various elements, oxygen, nitrogen, hydrogen, etc. During digestion, assimilation, respiration, and excretion the food taken undergoes many changes, breaking down into simpler compounds or being transformed into others. These changes are termed *metabolism*. While not a food, the oxygen of the air plays an important part in nutrition.

In youth, until the body attains its full size, material is needed from which to build the tissues. This material is derived from the food. From birth until death the life-processes cause a constant waste of the

tissues, and this waste must be replaced or the body will become unable properly to carry on its functions. Only protein substances, that is to say, food containing nitrogen, can be used for this purpose. Fat may be used to store material in the connective tissue for future use as fuel, and also to protect the body from cold.

Every act consumes energy. If a man lifts a pound a foot high, he must reproduce in his body that amount of energy. This energy is obtained from the food. The force that holds the food elements together in combination is called potential energy. In breaking up the food into simpler compounds the body sets this energy free or changes it into kinetic energy. The changes by which this is brought about are not very well understood at present, but they may be likened to combustion; thus we speak of "burning" up the food-material in the body, as if the body were a very superior kind of furnace, for the changes that go on are, for the most part, very probably a sort of complex oxidation. Proteins, fats, and carbohydrates may all be burnt up to furnish heat and energy; the last two—fats and carbohydrates—are used exclusively for one or the other purpose, if we regard the fat stored in the body merely as fuel for future use.

The salts aid in the digestive and other processes, and are utilized in the composition of the bones and teeth. Water is probably not used to furnish energy, but it serves as a menstruum, if the term be allowable, for the processes. Vitamins are substances essential to life—at present not very well understood.

Atwater gives the following table to illustrate the uses of the different food elements:

Nutritive Ingredients of Food.

Food as purchased contains—
- Edible portion—*e. g.*, flesh of meat, yolk and white of egg, wheat flour, etc.
  - Water.
  - Nutrients.
    - Protein.
    - Fats.
    - Carbohydrates.
    - Mineral matter.
- Refuse—*e. g.*, bones, entrails, shells, bran, etc.

Uses of Nutrients in the Body.

Protein—forms tissues—*e. g.*, white (albumin) of eggs, curd (casein) of milk, lean meat, gluten of wheat, etc. Fats—are stored as fat—*e. g.*, fat of meat, butter, olive oil, oils of corn, wheat, etc. Carbohydrates—are transformed into fat—*e. g.*, sugars, starches, etc. Mineral matters (ash)—share in forming bone, assist in digestion—*e. g.*, phosphates of lime, etc., potash, soda, etc.	All serve as fuel to yield energy in the forms of heat and muscular power.

To the above vitamins should be added.

After the body has reached its full development, the body-weight

remains more or less constant, and the food that has been used is excreted by means of the respiration and the urine, and, to a large extent, by the feces.

The well-known law concerning the conservation of energy apparently applies to metabolism in animal bodies, and this has been practically proved, although the experiments have never quite reached the ideal owing to the almost insurmountable difficulties that attend such experiments. In other words, food that is used in the body furnishes the same amount of energy that it would furnish if burnt in a furnace or calorimeter, providing the end-products in each case are the same. The heat-values of foods may therefore be taken as a standard of their food-value, but it must always be remembered that in the practical application of this fact in working out dietaries the digestibility and adaptability of a food are of great importance, as well as the amount of energy it contains.

The heat-value of various foods may be determined experimentally by the use of an instrument known as a bomb calorimeter, the result being expressed in *calories.* A calorie is the amount of heat that is necessary to raise the temperature of 1 kilogram of water 1 degree C. (It is nearly the same as the amount required to raise 1 pound of water 4 degrees F.) This, expressed in mechanical force, means that a calorie would raise a ton about 1.54 feet, or that it is equal to 1.54 foot-tons.

According to Atwater, the fuel-value of the various classes of food as ordinarily supplied is as follows:

1 gram of protein furnishes 4 calories; 1 pound furnishes 1820 calories.
1 " fat " 8.9 " ; 1 " " 4040 "
1 " carbohydrate furnishes 4 calories; 1 pound furnishes 1820 calories.

These figures are somewhat lower than the figures given by older estimations, and are based upon the most recent experiments. The fuel-values formerly given were: protein and carbohydrates, 4.1 calories per gram; fat, 9.3 calories per gram. It will be observed that fat has a very high food-value, which doubtless explains why it is stored as a reserve fuel.

The earlier metabolism studies were largely concerned with the chemical composition of the food as taken into the body and the composition of the urine and feces. Chemical balance sheets dealing chiefly with the carbon were prepared by Liebig as early as 1840. The nitrogen balance and the balances of calcium, magnesium and the other constituents have come in for a large amount of work and we are but on the threshold. In addition to the chemical balances the study of the energy metabolism and the gaseous exchange have occupied the time of the more recent investigators. The first respiratory calorimeter was built by Pettenkofer and Voit. Since then Rubner, Zuntz and Geppert, Pashutin and, in this country, Atwater and

Rosa, Benedict, Lusk, and many others have worked with this valuable apparatus. The Atwater-Rosa calorimeter was built at Middletown, Connecticut, but has been moved to Washington. Langworthy and Milner have described it in detail in the Journal of Agricultural Research, Volume 5, No. 8, and a shorter account will be found in Lusk's Science of Nutrition. This first American apparatus is a large affair capable of allowing a man to be up and exercising on a stationary bicycle and experiments lasting for days can be carried on with it. The first work was largely on normal individuals, but more recently the metabolism of diseased conditions has been studied. For this purpose smaller calorimeters are used, such as the Sage apparatus at Bellevue Hospital, which consists of a copper box about the size of a lower berth in a sleeping car. It has a comfortable bed, two windows, a telephone, a fan, a shelf and a Bowles stethoscope for counting the pulse. The patient must keep quiet and as this is difficult for more than three or four hours the periods of observation are limited. By this apparatus the amount of heat produced by the individual may be measured directly and also indirectly by calculating the chemical measurements of the gaseous exchange in terms of heat, or indirect calorimetry. In the first method the heat given off is measured by its being taken up by a stream of cold water flowing in pipes in the top of the box and the amount excreted in the moisture from the lungs is calculated from the amount of water excreted in the lungs, which is caught up by a sulphuric acid bottle in the ventilating current. The second method consists of measuring the water and carbon dioxid given off. The water is collected as above and the carbon dioxid by passing the air through weighed bottles of soda-lime and sulphuric acid. The air is used over and over again and the oxygen supplied from a weighed bomb to keep the air normal. The figures obtained by dividing the liters of carbon dioxid produced by the liters of oxygen consumed is the respiratory quotient. Knowing this and the amount of nitrogen in the urine it is possible to calculate the grams of protein, fat and carbohydrate metabolized each hour, and by multiplying by their heat values the number of calories.

The so-called basal metabolism is studied, the heat produced during complete rest fourteen hours or more after the last meal, and this is compared to the normal man. As Rubner demonstrated, the metabolism is proportionate to the surface area of the body and all animals have about the same heat production per square meter of body surface. The larger animal produces more heat, but the amount per kilo of body weight is greater the smaller the animal, that is, the metabolism is higher.

The metabolism in hyperthyroidism, Graves' disease, is greatly increased, while in cretins and myxedema it is greatly decreased. In typhoid fever the metabolism is increased, being approximately proportional to the rise in temperature.

An account of the calorimeter in clinical medicine by DuBois, will be found in the American Journal of the Medical Sciences, June, 1916.

The whole subject is in its infancy and the near future will doubtless give us a great many facts of practical value.

Respiration Experiments.—As foods are oxidized in the body, the metabolism may be determined by estimating the amount of oxygen used. The respiration apparatus used in experiments of this kind consists of a mouth- and nose-piece connected with apparatus devised to measure the inspired and expired air. The amount of oxygen entering the lungs and the amount leaving can thus be determined, and the difference represents that used in the body. This method has the advantage that the results may be obtained quickly and the apparatus is portable. Estimations are made from time to time, and the totals for the twenty-four-hour or other periods based on these.

Approximately, 1000 c.c. oxygen will unite with either 1.05 gram protein, 0.5 gram fat, or 1.34 gram sugar. The carbon dioxid given off is also estimated, and this, divided by the oxygen consumed, gives the "respiratory quotient." This is used in estimating the total energy used. To do this the amount of food used must be known, and this is determined by estimating the food eaten and the composition of the urine and feces as regards the carbon and nitrogen contained.

The heat production of the body fourteen hours after taking food with the subject at physical and mental rest is the individual's basal metabolism. There are various forms of apparatus used to determine this. The one devised by Benedict is frequently employed. Much valuable information has been obtained which may be of value in managing the diet in disease. Thus it may be lowered in diabetes, in nephritis with edema, in prolonged undernutrition and many diseases in which this occurs, and especially in cretinism and myxedema. These patients use less food than the average for maintaining life. On the other hand, more is burned in Graves' disease, in fevers such as typhoid, in cardiorenal disease with dyspnea, in pernicious anemia, and leukemia.

The Biological Method of Food Analysis.—As long as food investigations were confined to chemical analysis and respiration experiments much valuable data was necessarily overlooked. For the history and the details of this work the reader is referred to such books as McCollum's Newer Knowledge of Nutrition; Eddy's Vitamin Manual, and Mendel's Nutrition.

It is indeed curious that attention was not drawn to these subjects earlier, for scurvy, pellagra, and beriberi were early recognized as diseases produced by defective diets, but with the exception of scurvy

nothing was done until Eijkman, in 1897, published his remarkable observations on the artificial production of polyneuritis in fowls. Since then a large number of observers have been working at the problem. The earlier scientific observations were made with a view of determining the best rations for domestic animals, with reference to milk production, breeding, fat producing, flesh producing, egg laying, and the like. Observations on small laboratory animals have been and are being made with reference to the vitamin content of foods, the quality of various proteins, fats, and carbohydrates, of organic forms of phosphorus, and other questions of a similar nature. The value in growth and nutrition of the various amino-acids is another subject upon which light has been thrown by the use of this method.

The importance of this means of study can scarcely be overestimated, and in the future it will be needed more and more owing to the increasing use of artificial and preserved foods. Eventually we may look for classification of food-stuffs with reference to their biological properties as food.

Experimental observations have shown, too, that an adequate diet may be remarkably simple or that a diet made up of a great many different foods may still be faulty. A further consideration of this subject is given in the section on the Deficiency Diseases, but for any extended account the reader is referred to the books mentioned above or to similar works.

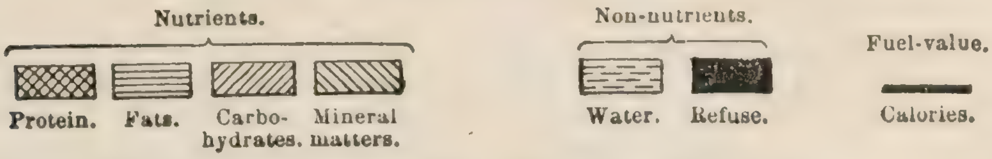
FOODS AND THEIR COMPOSITION.

Not only is it desirable to know about the digestibility of foods, but it is necessary to know about the composition of foods. The amount of protein or, what amounts to the same thing, the amount of nitrogen in any given food is the first point of interest. If the amount of nitrogen is known, the protein content is obtained by multiplying by 6.25. The protein content is important for many reasons, and is considered under the heading of The Quantity of Protein Required. Some foods contain nitrogen in the form of chemical compounds, containing C_5N_4 or the so-called purin bodies. These are important in certain diseases, as gout, and are taken up under the heading of Purin Metabolism and Gout. The amount of nitrogenous food is a very great factor in all diets. The percentage of fat is likewise of importance, and in some diseases and under certain conditions it is desirable either to use large quantities of fat or to avoid fatty foods. The carbohydrate percentage enters largely in the feeding of some patients, as in diabetes and the obese.

The Heat and Energy Value of Food.—As mentioned above, it is convenient to think of foods as fuel, and that they each furnish a certain available amount of heat or energy. So much in protein, so

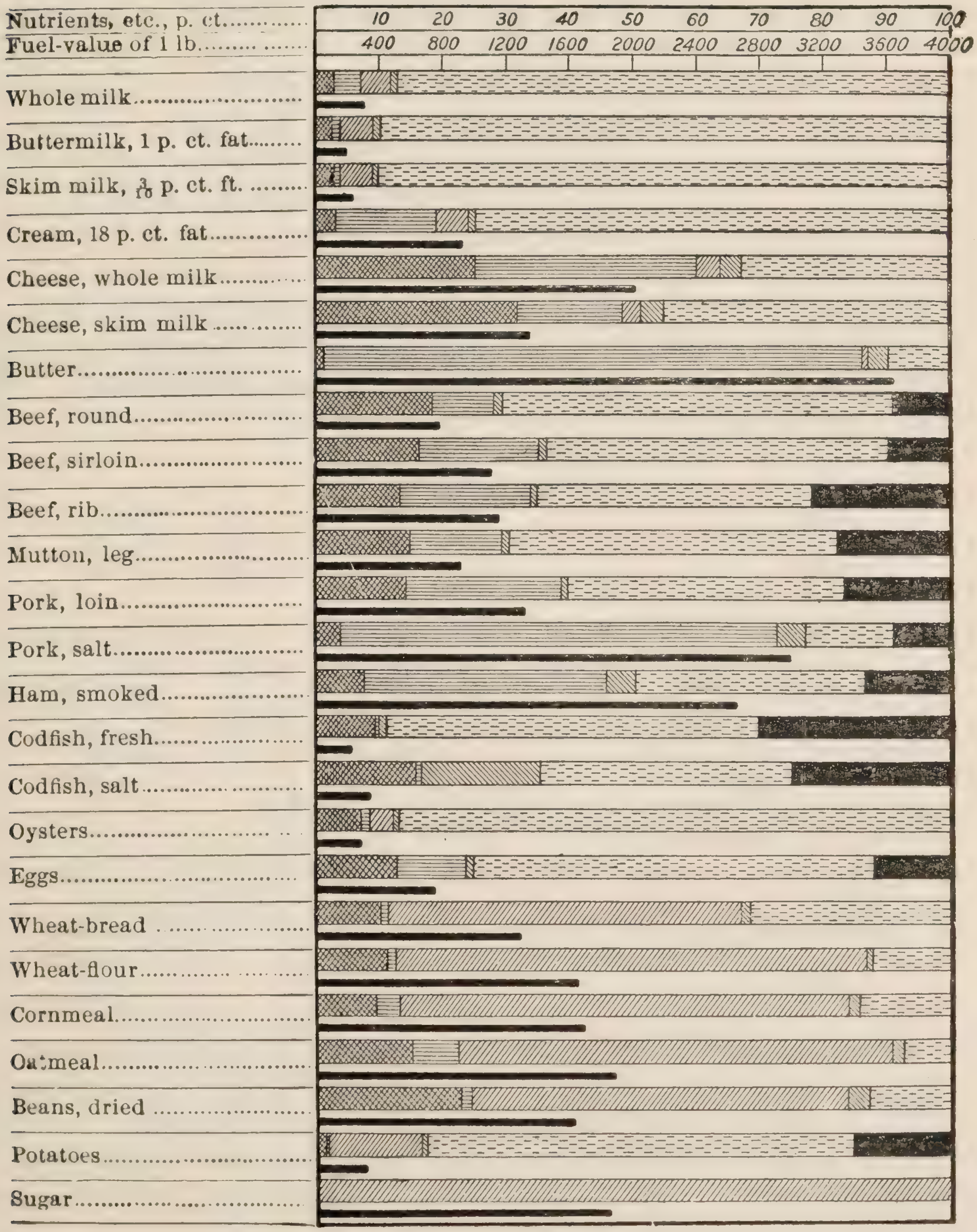
COMPOSITION OF MILK AND OTHER FOOD-MATERIALS.

Nutritive ingredients, refuse, and fuel-value.



Protein compounds, *e. g.*, lean of meat, white of egg, casein (curd) of milk, and gluten of wheat, make muscle, blood, bone, etc.

Fats, e. g., fat of meat, butter, and oil, } serve as fuel to yield heat and muscular
Carbohydrates, e. g., starch and sugar, } power.



much in fat, so much in carbohydrate. Some foods are all protein, as the white of egg; some all fat, as butter; and some all carbohydrate, as sugar. Most foods are, however, combinations of all these, and contain, in addition, certain salts and water. The water is not metabolized, and need not be considered in taking up the question of food values. The salts furnish so little energy that they too need not be counted, but they are of very great value in metabolism, and as our knowledge of them increases their importance is more and more emphasized. (See Salt Metabolism.) There are many problems in connection with the energy contained in foods, and they will be considered briefly.

There are two series of estimates, one made chiefly by Rubner and generally used in dietetic computations. The other was made subsequently by Atwater, and his values are a little lower and perhaps more correct. Owing to the differences, discrepancies will be found in various tables and in different books, and these depend in part on the use of different standards in making the computations. At the present time the application of the food values to the diet as made by the general practitioner is only approximate at best, so that these discrepancies are not so important as would seem at first sight. The standards are as follows:

Calories per Gram.

	Protein.	Fat.	Carbohydrate.
Rubner	4.1	9.3	4.1
Atwater	4.0	8.9	4.0

To determine the fuel value of any food it is only necessary to multiply the percentage contained in 100 parts of the food by 4.1 for the protein and carbohydrate, and by 9.3 for the fat. For example, 100 grams of milk contain 3.50 per cent. protein, 4 per cent. fat, and 4.50 per cent. sugar.

Caloric value of 100 grams of that milk would be

Protein	$3.50 \times 4.1 = 14.35$
Fat	$4.00 \times 9.3 = 37.20$
Carbohydrate	$4.50 \times 4.1 = 18.45$
Total value	70.00

Numerous tables will be found throughout this book and extensive ones at the end dealing with the percentage composition in common use. If the caloric value per pound is given and it is desired to have it in grams, it may be remembered that 1 pound equals approximately 454 grams (453.60).

It is desirable not only to know how many calories are in a given quantity of food, but how much is furnished by each constituent, so that the diet may be prescribed that contains a high or low protein content, a high or low fat content, or a high or low carbohydrate content, as may suit the particular case on hand. The total food

requirement must, however, always be borne in mind, and if one constituent is low, an increase corresponding to it must be made in one of the others.

The fuel values of meats are usually stated too high, as much of the fat supposed to be included is trimmed off either by the butcher or the cook. The bulk of a food gives but little idea of its food value, as bulk often means a high water content. An ounce of fat, for example, is equal to about 2 pounds of cabbage.

Nutritive Ratio.—In order to give some idea of the value in nitrogen or protein to the other constituents of the food, what is called the nutritive ratio is often stated in speaking of diet or foods.

This may be expressed as:

$$\text{Protein} : \text{Carbohydrate} + 2\tfrac{1}{4}\ \text{Fat} :: 1 : x$$

Or,

$$\frac{\text{Carbohydrate} + 2\tfrac{1}{4}\ \text{Fat}}{\text{Protein}}$$

In other words, it expresses the ratio between the amount of digestible protein and the amount of digestible carbohydrates plus the digestible fats. The fats are expressed in terms of carbohydrates, and 1 gram of fat is considered equal to 2¼ grams of carbohydrate. For example, in Voit's standard dietary there is:

Protein	118 grams.
Fats	56 "
Carbohydrates	500 "

The digestible part may be obtained by using the coefficients of digestibility, and we find these amounts:

Digestible protein	$118 \times 0.92 = 108.56$
Digestible fat	$56 \times 0.95 = 53.20$
Digestible carbohydrates	$500 \times 0.97 = 485$

The fat in terms of carbohydrates is $52.20 \times 2.25 = 119.7$.
The total fat and carbohydrate in terms of carbohydrates is $485 + 119.7 = 604.7$.
The nutritive ratio is $108.56 : 604.7$ or $1 : 5.5$.

Under ordinary conditions the ratio should not vary below 5 nor above 7. Of late the tendency is to widen the ratio, that is, to increase the carbohydrate factor.

Total Food Requirements.—The next question is how much food, *i. e.*, how many calories, are needed by the body under ordinary conditions. This may be expressed in two ways: first, as so many calories per kilo or per pound of body-weight, or, as is frequently used for general discussions, the amount needed by a man of average weight, say 70 kilos or 154 pounds. The problem may be approached in two ways: One method much used is to study the food actually consumed by groups of individuals living under certain conditions, and by making averages determine what is taken. Just because a great many people take a certain amount of food is no reason that it

represents the optimum, as it is well known that the food eaten varies with the kind and amount available. On the other hand, it represents a practical guide, as we know that large groups of people have lived on such an amount of food and maintained health and strength on it.

Another method in vogue at present in the scientific study of food requirements is to determine the amount of heat given off by the body while in the calorimeter, as explained above.

There are but very few calorimeters in existence, and the method is expensive, so that more frequent studies are made on the amount of oxygen consumed and the respiratory quotient. This may be done by a simpler form of respiratory apparatus. Another valuable method of study is to determine the balance of the intake and output of nitrogen and carbon.

The following figures are those of Rubner for an adult weighing 65 kilos:

During rest in bed	1800	calories or	28	calories	per kilo.
In repose	2100	"	32	"	"
In light work	2300	"	33	"	"
In moderate work	2600	"	40	"	"
In hard work	3100	"	48	"	"

These requirements vary owing to circumstances, and the needs during illness, as fever, are not those of good health. Some of the more important factors bearing on the total food requirement may conveniently be noted here.

Occupation or the character of the work performed has a great deal to do with the amount and character of food needed. The table on the opposite page from Atwater should be studied in this connection.

Tigertedt estimates the food requirements for various classes of labor as follows:

Shoemaker	2001–2400	calories.
Weaver	2401–2700	"
Carpenter or mason	2701–3200	"
Farm laborer	3201–4100	"
Excavator	4101–5000	"
Lumberman	Over 5000	"

In this connection it is of interest to note the results obtained by Atwater and Benedict. The following show the average requirements of a vigorous young man:

Man sleeping	65	calories	per hour.
Man sitting at rest	100	"	"
Man at light muscular exercise	170	"	"
Man at active muscular exercise	290	"	"
Man at severe muscular exercise	450	"	"
Man at very severe muscular exercise	600	"	"

Food-consumption of Persons in Different Circumstances, and Proposed Dietary Standards.

(Quantities per Man per Day.)

	Number of studies included in averages.	Actually eaten.			Digestible.			Fuel-value.	Nutritive ratio.
		Protein.	Fat.	Carbohydrates.	Protein.	Fat.	Carbodydrates.		
PERSONS WITH ACTIVE WORK.		*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Calories.*	*1:*
Rowing clubs in New England	7	155	177	440	143	168	427	3955	5.6
Bicyclists in New York . . .	3	186	186	651	171	177	631	5005	6
Football teams in Connecticut and California	2	226	354	634	208	336	615	6590	6.6
Prussian machinist	1	139	113	677	128	107	657	4270	7
Swedish mechanics	5	189	110	714	174	104	693	4590	5.3
PERSONS WITH ORDINARY WORK.									
Farmers' families in eastern United States	10	97	130	467	89	124	453	3415	8.2
Mechanics' families in United States	14	103	150	402	95	143	390	3355	7.5
Laborers' families in large cities of United States . . .	12	101	116	344	93	110	334	2810	6.3
Laborers' families in United States (more comfortable circumstances)	2	120	147	534	110	140	518	3925	7.6
Russian peasants	. .	129	33	589	119	31	571	3165	5.4
Swedish mechanics	6	134	79	523	123	75	507	3330	5.5
PROFESSIONAL MEN.									
Lawyers, teachers, etc., in United States	14	104	125	423	96	119	410	3220	7.1
College clubs in United States	15	107	148	459	98	141	445	3580	7.8
German physicians	2	131	95	327	121	90	317	2680	4.3
Japanese professor	1	123	21	416	113	19	403	2345	4
MEN WITH LITTLE OR NO EXERCISE.									
Men (American) in respiration calorimeter	11	112	80	305	103	76	296	2380	4.5
Men (German) in respiration apparatus	5	127	80	302	117	76	293	2430	4
PERSONS IN DESTITUTE CIRCUMSTANCES.									
Poor families in New York City	11	93	95	407	86	90	395	2845	6.9
Laborers' families in Pittsburg, Pa	2	80	95	308	74	90	299	2400	6.8
German laborer's family . . .	1	52	32	287	48	30	278	1640	7.2
Italian mechanics	5	76	38	396	70	36	384	2225	6.6
MISCELLANEOUS.									
Negro families in Alabama and Virginia	39	86	145	440	79	138	427	3395	9.3
Italian families in Chicago	4	103	111	391	95	105	379	2965	6.5
French Canadians in Chicago	5	118	158	345	109	150	335	3260	6.2
Bohemian families in Chicago	8	115	101	360	106	96	349	2800	5.3
Inhabitants Java village, Columbian Exposition, 1893	1	66	19	254	61	18	246	1450	4.7
Russian Jews in Chicago . .	10	137	103	418	126	98	405	3135	5
Mexican families in New Mexico	4	94	71	618	86	67	595	3460	8.7

Food-consumption of Persons in Different Circumstances and Proposed Dietary Standards.

(Quantities per Man per Day.)

	Number of studies included in averages.	Actually eaten.			Digestible.			Fuel-value.	Nutritive ratio.
		Protein.	Fat.	Carbohydrates.	Protein.	Fat.	Carbohydrates.		
MISCELLANEOUS (*Continued*).		*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Gm.*	*Calories.*	*1:*
Chinese dentist in California	1	115	113	289	106	107	280	2620	4.9
Chinese laundryman in California	1	135	76	566	124	72	549	3480	5.7
Chinese farm laborer in California	1	144	95	640	132	90	621	3980	6.2
United States army ration, peace	..	120	161	454	110	153	440	3730	7.1
German army ration, peace	..	114	39	480	105	37	466	2725	5.2
DIETARY STANDARDS.									
Man at hard work (Voit)	..	145	100	450	133	95	437	3270	4.9
Man at moderate work (Voit)	..	118	56	500	109	53	485	2965	5.5
Man with very hard muscular work (Atwater)	..	175	[1]	[1]	161	[1]	[1]	5500	7.2
Man with hard muscular work (Atwater)	..	150	[1]	[1]	138	[1]	[1]	4150	6.2
Man with moderately active muscular work (Atwater)	..	125	[1]	[1]	115	[1]	[1]	3400	6.2
Man with light to moderate muscular work (Atwater)	..	112	[1]	[1]	103	[1]	[1]	3050	6.1
Man at "sedentary" or woman with moderately active work (Atwater)	..	100	[1]	[1]	92	[1]	[1]	2700	6.1
Woman at light to moderate muscular work, or man without muscular exercise (Atwater)	..	90	[1]	[1]	83	[1]	[1]	2450	6.1

These results may be used to ascertain in a general way the food requirements of individuals when their mode of living is known, as in institutions. There will be a margin of error, but the result will be of service in completing diets:

8 hours of sleep at 65 calories	520	calories.
2 hours' light exercise at 170 calories	340	"
8 hours' active exercise at 290 calories	2320	"
6 hours' sitting at rest at 100 calories	600	"
Total food requirement for the day	3780	"

(Sherman.)

The amount of tension under which the work is done will have something to do with the amount of food required. If the work is done with a great deal of nervous energy, as in racing and contests of various kinds, the food requirements will be greater than if the work is done slowly and under less pressure.

Even if no muscular work is done, there will be a certain amount of food required to maintain the body. Various estimates have been

[1] Fats and carbohydrates in sufficient amounts to furnish, together with the protein, the indicated amount of energy.

made as to where this energy goes. Perhaps the greatest demand is to maintain muscle-tone or muscle-tension, and it is thought that from a third to a half of the energy required at rest is utilized by this function of the body. This is less during sleep than during waking hours. The circulation takes 5 to 10 per cent., and respiration from 10 to 20 per cent., and about 8 to 12 per cent. are supposed to be expended in digestion and assimilation. No very definite suggestions have been made concerning the amount needed for the work of the secreting glands or the nervous system.

Metabolism goes on whether resting or working, and also whether fasting or taking food. Metabolism is lessened by resting, still more by sleeping, and also by starvation, and each day that the fasting goes on there is a rather lessened metabolism. On the whole, however, the fasting metabolism is rather constant, and the energy is derived from the tissues of the body. First, the glycogen is stored in the muscles, and then the body-fat and other structures of the body. If food is not supplied after a certain length of time, death ensues. If food is given, the metabolism is raised, so that within certain limits the more food taken the more will be metabolized.

Requirements in Disease.—These may vary greatly and we are in need of studies on the nutrition in the various diseases. In some conditions, as in fever, the metabolism is greatly increased and the same is true of Graves' disease. In other diseases the heat production may be below normal, due to retarded metabolism; examples of this are myxedema and constitutional obesity.

Mental Work and Metabolism.—Curiously enough, mental work does not apparently utilize either heat or energy in the ordinary way. A man of a high degree of intellect in a respiration calorimeter does not cause any difference in the registration by hard mental work, such as working out abstruse mathematic problems requiring hours of time. The same apparatus, however, is sufficiently sensitive to register the heat generated by turning over in bed or by raising the arm.

Metabolism and Heat.—The body heat is maintained at or about 98.2° F., regardless of the external temperature. The heat is largely regulated by the exercise of the body, but in extremes the rate of food oxidation may be changed. In cold weather more food will be required than in warm.

Metabolism and Fever.—In febrile conditions the food requirements of the body are raised, and an increased amount of food should be given to cover this. (See Feeding in Fevers.)

Climate.—In cold climates fat and protein foods are used more largely, while in hot climates carbohydrates are preferred. Woodruff is of the opinion that climate affects the diet, mainly by the supply it affords.

Race.—The food of different races varies widely, but this is due, for the most part, to the varying conditions under which they live, and especially to the food-supply that is most available by reason of cost and the ease with which it can be procured. The Eskimos subsist largely upon raw or partly cooked meat and use large amounts of fat. In the torrid zone the natives eat largely of cereals, fruits and vegetables. In the temperate zones the diet is mixed, and is dependent largely upon social and financial conditions, being of the most varied character in the case of the well-to-do, whereas among the poor it is apt to be made up of the cheaper meats, breads and vegetables. Soldiers and travelers from the temperate zones, going either north or south, usually require approximately the same varieties of food they had at home. Soldiers in the tropics crave and eat meat, when they can obtain it, and in almost as large quantities as they would at home, and even after years of life in the tropics do not make any great change in their diet.

Major Charles E. Woodruff, Surgeon U. S. A., expresses the following opinion: "All natives of the tropics (where civilization causes over-population) are in a condition of nitrogen starvation and need much more nitrogen than they can possibly get. The old standards of teaching that we should eat as the natives is most vicious. They do not eat meat because they can not get it. They crave it, need it, and eat it when they can. On account of the destructive effects of the concentrated tropical actinic rays on protoplasm we need more nitrogen than at home. Please don't copy the old falsehood that we need less. It is also true that we need fat, as it furnishes energy better than carbohydrates. It is eaten in preference to starches and sugars for this purpose by workers when they can afford it, but they take to starch (rice) because it is cheaper. It is incorrect to say that it overheats. It does not overheat us, and it is false to say that fat is not needed in the tropics."

An interesting study of the foods used by different races of people has been made by Landis, of the Phipps Institute of Philadelphia. The figures are reduced to a per man basis, the members of the household being rated in terms of adult males, and children being classed in terms of fractions of the male unit.

Family	Italian			Negro		
	C—o	S—o	S—r	B—d	B—t	W—e
Number "men"	4.3	7.6	2.6	4.2	2.5	4.1
Calories per man per day	2887.0	2589.9	2605.0	2774.7	3697.3	2138.8
Cost food per man per day	$0.158	$0.229	$0.187	$0.21	$0.2496	$0.19
Calories for $.10, inc. seasoning and beverages	1813.5	1127.0	1389.0	1317.3	1276.1	1122.1
Protein calories per man per day	334.3	355.3	202.1	349.2	356.3	236.9
Proportion protein	11.6%	13.7%	7.7%	12.5%	9.6%	11.1%
Proportion fat	18.5%	20.8%	19.3%	37.0%	55.4%	31.2%
Proportion carbohydrates	69.8%	65.4%	72.9%	50.4%	34.9%	57.6%

	Italian	Negro
Average calories per "man" per day	2690.6	2870.2
Average cost per man per day	$.191	$.2165
Average calories for $.10	1443.1	1238.5
Average protein calories per man per day	297.2 (74.3 grammes)	314.1 (78.5 grammes)

	Jewish			Polish		
Family	H—n	C—r	S—r	S—z	D—y	Z—y
Number "men"	2.5	2.4	2.3	2.9	3.2	2.4
Calories per man per day	2118.05	3279.9	2521.1	3399.64	2997.3	2975.2
Cost food per man per day	$0.2238	$0.3041	$0.195	$0.4118	$0.328	$0.321
Calories for $.10, inc. seasoning and beverages	946.13	1078.32	1290.6	884.46	970.5	926.7
Protein calories per man per day	314.28	406.45	331.3	511.0	420.1	468.3
Proportion protein	14.8%	12.4%	13.1%	15.0%	14.1%	12.4%
Proportion fat	25.8%	32.0%	24.9%	37.3%	28.8%	25.6%
Proportion carbohydrates	59.3%	55.5%	61.9%	47.6%	57.1%	61.9%

	Jewish	Polish
Average calories per "man" per day	2693.7	3124.04
Average cost per man per day	$.2409	$.3469
Average calories for $.10	1105.01	927.22
Average protein calories per man per day	350.67 (87.8 grammes)	433.1 (108 grammes)

Sex.—As a rule, women eat and require less food than men. This is largely due to the indoor and sedentary life led by so many women. Under equal conditions a woman of the same size requires the same amount of food as a man. On an average, women are only about four-fifths as large as men, and consequently, dietaries for groups of women will require about four-fifths the amount of food.

Size and Weight.—For adults living under the same conditions, the food requirements vary with the weight of the individual. The larger the body the more food will be required, but it should be noted that the requirement varies also directly with the amount of surfaces exposed, so that a small man, having a relatively larger surface, will radiate more heat and will require more food per kilo than a larger one. This has been tested experimentally both in man and in animals. As very obese individuals have a larger layer of fat which does not require as much energy to maintain as muscles, this also makes a difference in the food requirement. In computing dietaries these facts are rarely taken into consideration.

Food and the Skin Surface.—Rubner showed that the amount of food needed is directly proportional to the superficial area of the body, or in other words, the metabolism varies in direct proportion to the amount of skin surface. This is due to the fact that the larger the body the smaller is the proportion of surface to the weight and as most of the heat is lost from radiation from the surface a small sized animal loses much more heat in proportion than a large one. This is well illustrated in the caloric requirements of infants. The amount of food required may be estimated from the surface and tables have been worked out showing the skin surface of people of different

heights and weights. DuBois and DuBois (Archives of Internal Medicine, 1916, xvii, 855) have worked out a method which needs only the height in centimeters and the weight in kilograms to determine the surface area in meters.

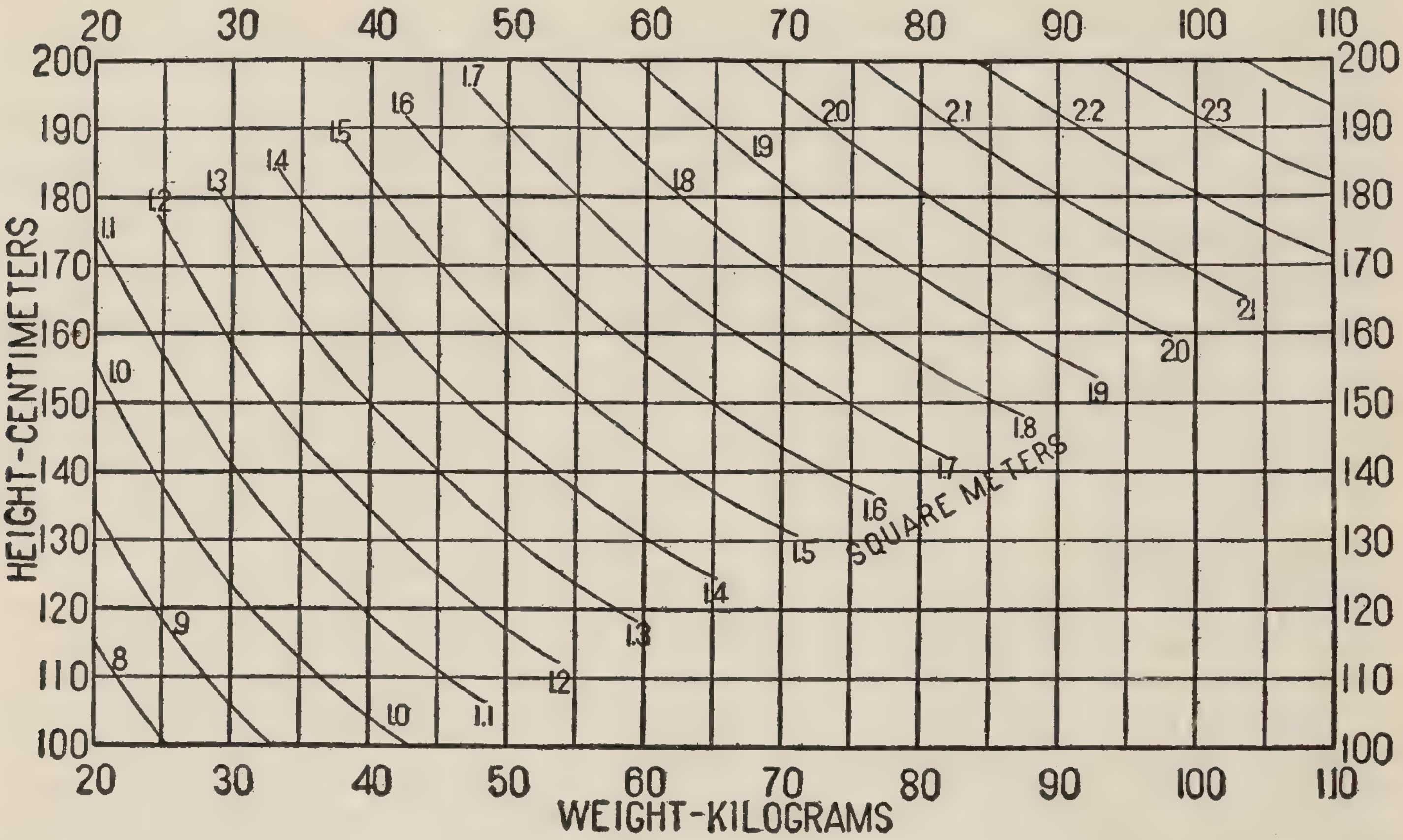


Chart for determining surface area of man in square meters from weight in kilograms (Wt.) and height in centimeters (Ht.) according to the formula: Area (Sq. Cm.) = $Wt.^{0.425} \times Ht.^{0.75} \times 71.84$.

A formula devised by Meehs and frequently used is $S = C \sqrt[3]{W^2}$ where S is surface, W weight, and C a constant dependent upon the shape and density of the solids; for man C is 12.3.

Caloric Requirement per square meter of body surface (Aub-Du Bois)

Age Years.	Males, Cal. per		Females, Cal. per	
	Hour.	Day.	Hour.	Day.
10-12	51.5	1236	50	1200
12-14	50	1200	46.5	1116
14-16	46	1104	43	1032
16-18	43	1032	40	960
18-20	41	984	38	912
20-30	39.5	948	37	888
30-40	39.5	948	36.5	876
40-50	38.5	924	36	864
50-60	37.5	900	35	840
60-70	36.5	876	34	816

Formulæ for calculating food requirement in grams from Caloric Requirement (M) (W. R. Campbell)

P = 2/3 gm. per Kg. body weight.

$$C = \frac{M - 10\,P}{30}$$

$$F = \frac{M}{10} - \frac{P}{2}$$

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Percentage Increase or Decrease in the Hourly Basal Metabolism for Various Factors affecting the Extent of Energy Metabolism (as adapted by Carter from the work of Lusk and Du Bois).

Average man, 154 pounds, (70 kg.) at complete rest, 70 Calories per hour:	Increase or decrease per cent.	Additional calories per hour for average man.
	Increase.	
Ingestion of food	5 to 10	4 to 7
Lying in a chair, supported	0	0
Sitting up in a chair	8	6
Moderate activity in chair	29	20
Very restless in bed	20 to 100	14 to 70
Exercise:		
Walking on level, 2.7 miles per hour	230	160
Climbing, 2.7 miles per hour	580	407
Hard labor, bicycle riding	756	529
Thin but healthy	0	0
Fat but healthy	0	0
Disease:		
Most patients not seriously ill	+ 10 to — 10	+ 7 to — 7
Obesity	+ 10 to — 10	+ 7 to — 7
Diabetes with severe acidosis	0 to 15	0 to 10
Severe pernicious anemia	0 to 20	0 to 14
Acromegaly	0 to 30	0 to 21
Cancer, severe heart and kidney disease and high fever	20 to 40	14 to 28
Leukemia	30 to 60	21 to 42
Typhoid fever	40 to 50	28 to 35
Convalescence	10 to 20	7 to 14
Exolphthalmic goitre:		
	Decrease.	
Mild	25 to 50	18 to 35
Severe	75 to 100	53 to 70
Prolonged undernutrition	— 10 to — 30	— 7 to — 21
Diabetes, emaciated	— 10 to — 35	— 7 to — 25
Cretinism and myxedema	— 25 to — 50	— 18 to — 35

Example.—A man of 50 years, weight 70 kilos (153 pounds), height 17 cm. (67 inches), in bed 8 hours, walks 1 hour, sits about or office work 14 hours, hard exercise 1 hour.

	Calories per hour.
a. Area, 1.8 square meters	
b. Basal metabolism per square meter	35.2
c. Individual basal metabolism 1.8 × 35.2 (Fractions are usually disregarded)	63.3
d. Increase for food ingestion 10 per cent. (in all calculations) 63 × 0.1	6.3
e. While in bed (c + d) 63 + 6	69
f. Increase for office, etc., 29 per cent. 63 × 0.29	18
g. Increase for walking 230 per cent. 63 × 2.3	145
h. Increase for hard exercise 756 per cent. 63 × 7.56	476

	Calories per day.
8 hours in bed 69 × 8	552
14 hours sedentary 69 + 18 × 14	1218
1 hour walking 69 + 145	214
1 hour hard exercise 69 + 476	545
Total per day	2529

As to the loss of heat from the body it has been estimated that 87.5 per cent. is lost by surface radiation, 10.7 per cent. through the lungs, and 1.8 per cent. through excretions.

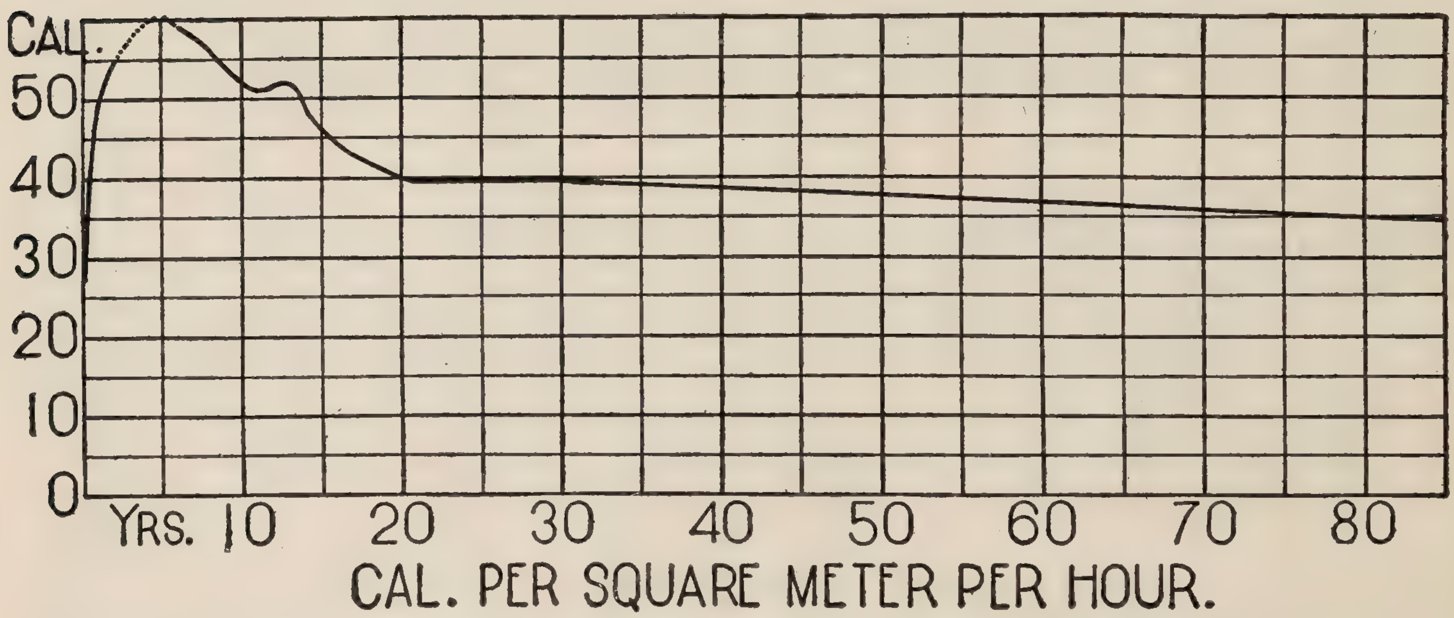
Photographic Method of Measuring the Surface Area of the Body.—Benedict (The American Journal of Physiology, 1916, xli, 275) has developed a simple method based on computations made of certain definite photographic poses (particularly the side view with the arm extended) that when compared with the results obtained by DuBois' linear formula, is strikingly accurate.

Age.—For the reason given above, and also due to differences in metabolism and owing to the influences of growth, the food requirements of the young is greater per kilo of body-weight than in adults. The food requirements during the first three months is 100 calories per kilo (45.4 per pound); during the second three months it is between 100 and 90 per kilo (40.9 per pound); during the latter half of the first year it sinks to 80 per kilo (36.4 per pound). Artificially fed children are thought to require slightly more than breast-fed children.

Gephart and DuBois (Archives of Internal Medicine, 1916, xvii, p. 913) have the following standards of normal metabolism per hour per square meter of body surface.

Standards of Normal Metabolism. Average Calories per Hour per Square Meter of Body Surface.

Subject, age in years.	According to Meehs' formula.	According to linear and height-weight formulas.
Boys, twelve to thirteen	45.7	49.9
Men, twenty to fifty	34.7	39.7
Women, twenty to fifty	32.3	36.9
Men, fifty to sixty	30.8	35.2
Women, fifty to sixty	28.7	32.7



This chart, prepared by Du Bois, shows the basal metabolism as measured in calories produced per square meter of body surface per hour from birth until the age of eighty-five years in human males. Between maturity and the eighty-fifth year there is a gradual fall in the intensity of metabolism of 13 per cent.

In computing dietaries for children the following tables of Gillett will be found useful:

Calorie Requirement of Children at Different Ages.

Age, Years	Calories Boys.	Calories Girls.
From 2 to 5	1,309	1,245
From 6 to 9	1,797	1,575
From 10 to 13	2,337	2,015
From 14 to 17	2,534	2,253

Food Allowances for Children.

Age, Years	Calories per day Boys.	Calories per day Girls.
Under 2	900–1,200	900–1,200
From 2 to 3	1,000–1,300	980–1,280
From 3 to 4	1,100–1,400	1,060–1,360
From 4 to 5	1,200–1,500	1,140–1,440
From 5 to 6	1,300–1,600	1,220–1,520
From 6 to 7	1,400–1,700	1,300–1,600
From 7 to 8	1,500–1,800	1,380–1,680
From 8 to 9	1,600–1,900	1,460–1,760
From 9 to 10	1,700–2,000	1,550–1,850
From 10 to 11	1,900–2,200	1,650–1,950
From 11 to 12	2,100–2,400	1,750–2,050
From 12 to 13	2,300–2,700	1,850–2,150
From 13 to 14	2,500–2,900	1,950–2,250
From 14 to 15	2,600–3,100	2,050–2,350
From 15 to 16	2,700–3,300	2,150–2,450
From 16 to 17	2,700–3,400	2,250–2,550

Care should be taken to individualize and active children require more than sedentary ones. In boys' schools and out-of-doors in camp the amount actually consumed and needed is between 4000 and 4500 calories per day. (See Feeding of School Children). It is interesting to compare these figures with the earlier ones. Atwater allowances are as follows:

Boy 15 to 16	years	requires	0.9	the food	of a man	at moderate work.
Girl 15–16	"	"	0.8	"	"	"
Boy 13–14	"	"	0.8	"	"	"
Girl 13–14	"	"	0.7	"	"	"
Boy 12	"	"	0.7	"	"	"
Girl 10–12	"	"	0.6	"	"	"
Boy 10–11	"	"	0.6	"	"	"
Child 6–9	"	"	0.5	"	"	"
Child 2–5	"	"	0.4	"	"	"
Child under 2	"	"	0.3	"	"	"

Sherman has approximated the average amounts as follows:

Boys of 14–17	2500–3000	calories.
Girls of 14–17	2200–2600	"
Children of 10–13	1800–2200	"
Children of 6–9	1400–2000	"
Children of 2–5	1200–1500	"
Children of 1–2	900–1200	"

Based on the amount per kilo:

Under 1 year	100	calories	per kilo.
Under 1–2 years	100–90	"	"
Under 2–5 years	90–80	"	"
Under 6–9 years	80–70	"	"
Under 10–13 years	70–60	"	"
Under 14–17 years	60–45	"	"

For the very young his estimate is somewhat larger than those made by Camerer, Heubner, and others.

After middle age is passed the food requirement diminishes, and in old age it is considerably less, owing to the lessened exercise and the lower ratio of metabolism. Without muscular labor the requirement per kilo has been estimated at sixty years of age at 34 calories per kilo, and at eighty years of age at 27 calories per kilo.

The Pirquet System of Nutrition.—During the late war large groups of children were fed abroad, and a new system was devised by Pirquet to regulate the amount furnished. This system, while of value in feeding large groups, does not seem to be much used in America. It is based on the sitting height, *i. e.*, the distance from the surface of the seat on which the body rests to the top of the head, which bears a close relation to the cube root of the body weight. The term "pelidisi" is used to express the formula which is the cube root of ten times the body weight which approximately equals the sitting height. The pelidisi have been worked out and are given in Pirquet's tables.[1] The unit of nutrition used by Pirquet is the "nem," the initials of Nahrungs, Einheit, Milch, or Nutrition, Equivalent, Milk, and is the full value of a gram of human milk, or one (large) calorie equals 1.5 nems, a decinem is one-tenth of a nem, a dekanem is ten nems, and so on. Hektonems or 100 nems is most used in computing diets. This method of computing diets cannot be presented in a small space, and inasmuch as it is but little used in America the reader is referred to the reference given for fuller information.

Nutrition and Growth.—Interesting studies have been made by Mendel and others. Growth depends on an inherited capacity to grow, a factor that cannot be modified at present, and on nutrition and environment, which are capable of control. The nutrition may be perfect and still abnormalities in growth occur, and on the other hand, the food may be more or less faulty or deficient without interfering greatly with the capacity to grow, even though what we term disease conditions are present.

It is an interesting fact that increasing the total amount of the protein in the diet does not force the growth nor make it go beyond the normal limits, although too great restrictions may interfere with growth, which begins again or increases when sufficient protein is supplied. Mendel and others have called attention to the importance of considering not the proteins as such, but their amino-acid content in relation to growth. By feeding experiments on animals they have tested various isolated proteins, in connection with the necessary carbohydrates, salts and fats and find that certain proteins permit of growth, as adestin, globulin, excelsin, glutelin and others of vegetable origin, and casein, lactalbumin and others of animal origin, and that failure to induce growth resulted from the use of gelatin, legumin,

[1] An outline of the Pirquet System of Nutrition, W. B. Saunders Co., 1922.

conglutin and others. The failure can be traced back to the absence of certain essential amino-acids, for example, gelatin and zein lack the tryptophan group. In cases where these are lacking and causing failure to grow, the addition of tryptophan as such results in maintenance, but no growth which, however, ensued on the addition of lysin. The future study of foods along this line will undoubtedly solve many of the problems in feeding, especially in infants and animals.

There has been an enormous amount written about the different carbohydrates, so necessary for nutrition and growth, but at the present time one cannot state which ones are best. Lactose is the form supplied in the milk for the growing young and would seem to be the best for growth in early life, but other sugars and starches have been highly recommended by pediatrists. The indispensability of true fats and lipoids to growth has not been proven, but the fatty foods contain substances that are necessary for nutrition and growth. (See Vitamins.) Investigation by numerous observers seems to show that the administration of cod liver oil, egg yolk and unwashed butter to undernourished infants and children rests on a sound foundation.

Striking observations have also been made on the failure of growth when the mineral salts were insufficient, even though the remainder of the diet was adequate.

Protein Requirements.—Having considered the total amount of food required, the next question is to determine how much protein, fat, and carbohydrate shall be used to furnish the requisite number of calories. There is a great deal of difference of opinion on this subject. At the present time there is considerable known concerning the minimum amount of protein required, and the maximum that can be metabolized without producing deleterious results. The protein optimum or the amount on which the body does best is still an open question.

There are several ways of taking up the subject. Voit and many others have studied the food taken by various individuals, and he found that an average sized man at moderate work took about 118 grams of protein together with some 56 grams of fat and 500 grams of carbohydrates. This represents some 18.8 grams of nitrogen. This amount was formerly regarded as a standard, but more recently there is a tendency to lessen the protein to 100 grams or less. Voit's standard is a liberal one, which need only be exceeded in some forms of tuberculosis and some other diseases, and which may be diminished in many diseased conditions to great advantage, as in gout and nephritis. The protein needs of the body will be more clearly understood by considering nitrogen metabolism.

Nitrogen Equilibrium.—It has been found in normal individuals that nitrogen equilibrium can be maintained on various amounts of protein food. This is determined by comparing the total amount ingested with the total amount excreted, or by making the comparison

of that absorbed with that which is utilized and excreted in the urine. If the amounts correspond or nearly so the body is said to be in a state of nitrogen equilibrium. The total amount of food required is governed largely by the exercise taken. It does not seem to matter so much what form the food is taken in, so long as it can be utilized. The protein metabolism, however, does not depend so much on the amount of exercise as it does on the food taken. If small amounts of protein are given, equilibrium may be established at a low level, and if large amounts are given, at a high level. Thus Chittenden was able to maintain health and strength on as little as 50 grams protein a day, and, on the other hand, nitrogen equilibrium has been established on as much as 150 grams a day and even 200 grams. The body is able to regulate the amount metabolized by the amount taken. If the body is not in a state of equilibrium it is either excreting more or less than is being ingested. In starvation, when none is supplied, it has been found that protein metabolism goes on about the same as when food is given, only that the total energy must be derived from the body itself. It has been estimated that 13 per cent. is furnished by the body-protein and 87 by the body-fat. A man at light work starving in a calorimeter was found to be using 1971 calories, or 31.23 per kilo of body-weight; 71.7 grams of protein were oxidized, and 181.2 grams of fat. In the first few days of fasting the nitrogen excretion is small, as there is a certain amount of glycogen which is stored in the body, and this is metabolized in place of the protein and so spares it. It has been found in lean animals later on in fasting that more protein is used in maintaining the body than in fat animals. In the fat animals the fat is used to a greater extent, and the fat may be regarded as sparing or protecting the protein.

The effect of carbohydrate and fats in protecting the body-protein holds good in feeding. If a diet is used which is low in protein, nitrogen equilibrium may be attained by adding either fats or carbohydrates to the diet, providing, of course, the protein intake does not fall below the minimum requirement. There may be a nitrogen loss when the total amount of food taken is below the requirement of the body, and this loss may be prevented by adding either carbohydrate or fat to bring it up to the standard. This is due to the fact that if the total of food supplied is too low, some of the body-protein is used to make up the deficiency. Gelatin may also be used as a sparer or protector of protein, 100 grams of gelatin being equivalent to about 35 grams of protein. It does not protect as well as either carbohydrate or fat. The nitrogen equilibrium is best maintained on a mixed diet, containing in addition to the protein both fat and carbohydrate. If the carbohydrate is out of the diet there will be a nitrogen loss, owing to the fact that there must always be a certain amount of glucose in the blood, and if this cannot be supplied from the carbohydrate of the food it will be formed from the body-protein.

It should be borne in mind that it takes some days to establish a nitrogen equilibrium when the customary diet is changed. If the usual diet of an individual contains 16 grams of nitrogen, and the diet is suddenly changed, it will be several days before equilibrium is established at the new level, whether it be above or below the amount usually metabolized. There will be slight losses of a transient character if somewhat less than usual is taken, but if the loss persists it means that either too little protein is being taken in the food, or that the total caloric value of the food is below the amount required, or that the body is affected with some disease attended with a loss of nitrogen, *i. e.*, some wasting disease.

If the nitrogen balance is disturbed so there is a plus balance, it means that nitrogen is being stored in the body. This occurs normally in young animals which are growing, in pregnancy, as the result of exercise that causes an increase in the size of the muscles, and in those who have had some disease where they have lost flesh and are regaining their normal weight.

Low Protein Standards.—Chittenden and his followers believe that the best diet is that which contains but little protein above the minimum, together with fat and carbohydrates to cover the needed calories. They urge that on this diet one may maintain health and weight, and that the mental and physical efficiency is greater than when more liberal diets are taken. They believe that as the proteins are oxidized with the formation of end-products more or less difficult of excretion, that any protein over the minimum requirement adds to the wear and tear of the body without increasing its efficiency. Chittenden's experiments included college professors and instructors, representing mental workers; United States soldiers, representing physical workers; college students, representing a combination of mental and physical workers. The experiments covered sufficiently long times, and it was found that nitrogen equilibrium could be maintained on 6 to 9 grams of nitrogen instead of the 16 or more usually taken by the average individuals. Fats and carbohydrates were added to bring the food-value up to 2500 or 2600 calories per day. This total would seem to be too low for men doing more than rather light work, whatever might be said of the protein content.

Value of Low Protein Diet.—Chittenden's experiments are of enormous practical value in showing that a low protein diet can be used over long periods of time without danger. Diets low in protein are of value in gout and gouty affections, in some skin diseases accompanying disorders of metabolism, in treating the ill-effects of habitual overeating in arteriosclerosis, in fevers and other affections. Brain-workers and those leading sedentary lives will also doubtless do better on diets lower in protein than those usually taken.

Objections to Low Protein Diet.—Many objections have been urged against this low standard of Chittenden. Perhaps the chief objection

is that the human race has automatically arrived at the diets usually taken after centuries of eating, and that people in general apparently do not suffer from diets reasonably high in protein.

Some have believed that while a low protein diet may be of great value over short periods of time, the prolonged use may render the body less resistant to infection or possibly cause ultimate disturbances in metabolism. Those accustomed by habit to low protein diet may have difficulty in utilizing larger amounts should greater demands be made upon the body.

In very hard work the fat and carbohydrate necessary may mean undesirable bulk and strain on the digestive organs, not to mention the less pleasing taste.

Another much used argument is that all successful races are meat eaters, but as a meat diet is expensive it may mean that the successful being able to buy meat prefers to eat it just as the rich consume expensive alcoholic drinks.

As a matter of fact the great majority of the human race will go on eating and drinking, according to their appetites and their means of gratifying them. Yet the problem is one which is of the highest human interest, especially in connection with the dieting in disease and in preventing it when danger has been anticipated. It is interesting to compare the navy diets made high in protein, because the sailor wants it and is happier and more contented and does better work than the crew on a perhaps more healthful, but less appetizing diet.

The High Protein Diet.—High protein diets—those over 120 grams—may be of use in certain conditions during pregnancy and lactation, in convalescing from wasting diseases, and in beginning, certainly, of physical training when muscle growth is great, and in combating certain diseases, as tuberculosis. During growth the protein requirements are higher than when adult life has been reached.

High protein diets are objectionable in the sedentary and in all of those conditions indicated as doing best on low protein diet, and in general it may be stated that unless one has a definite reason for doing so, the protein need not exceed the Voit standard.

The Protein Optimum.—This is an open question. As just stated, the protein need ordinarily not go above 120 grams for the average individual, nor under 60 grams. This leaves a rather wide range, and it is safe to say that the optimum lies between those two, and it will undoubtedly be found to vary with the individual and the conditions under which he lives. We do not believe that any standard will ever be fixed that will be of universal application, but we do think that in the future standards will be worked out to cover the various classes of normal conditions and the different disturbances of metabolism. Thus: In tuberculosis, 30 per cent. above the normal of the

given individual; in nephritis, 60 or 70 grams daily; in fevers, 70 grams, etc., are standards that are being put in practical use. Dietary standards have received general attention for such a short time that much may be expected along this line even in the near future.

The Amino-acids.—The problem of protein is not limited to the amount. The nature of the protein used is of the utmost importance and just beginning to be understood. Proteins are exceedingly difficult of analysis, but chemists have succeeded in finding out that proteins are made up of the amino-acids, each protein containing various amino-acids in various amounts. The following table shows the composition of some of the proteins used for food:

Quantitative Comparison of Amino-Acids Obtained by Hydrolysis from Proteins.
(Compiled by T. B. Osborne, 1914) [1]

	Casein.	Oval-bumin.	Gliadin.	Zein.	Edestin.	Legumin (Pea)
Glycocoll	0.00	0.00	0.00	0.00	3.80	0.38
Alanin	1.50	2.22	2.00	13.39	3.60	2.08
Valin	7.20	2.50	3.34	1.88	6.20	?
Leucin	9.35	10.71	6.62	19.55	14.50	8.00
Prolin	6.70	3.56	13.22	9.04	4.10	3.22
Oxyprolin	0.23	?	?	?	?	?
Phenylalanin	3.20	5.07	2.35	6.55	3.09	3.75
Glutaminic acid	15.55	9.10	43.66	26.17	18.74	13.80
Aspartic acid	1.39	2.20	0.58	1.71	4.50	5.30
Serin	0.50	?	0.13	1.02	0.33	0.53
Tyrosin	4.50	1.77	1.61	3.55	2.13	1.55
Cystin	?	?	0.45	?	1.00	?
Histidin	2.50	1.71	1.49	0.82	2.19	2.42
Arginin	3.81	4.91	2.91	1.55	14.17	10.12
Lysin	5.95	3.76	0.15	0.00	1.65	4.29
Trytophan, about	1.50	present	1.00	0.00	present	present
Ammonia	1.61	1.34	5.22	3.64	2.28	1.99
	65.49	48.85	84.73	88.87	82.28	57.43

Van Slyke has summarized the results of the various investigators from Spallanzani and Beaumont to Cohnheim, and we have condensed somewhat his statement which is as follows: "The proteins enter the stomach and are digested to albumoses, that is, the long protein chain of amino-acids is broken into somewhat shorter, but still somewhat long chains, and the protein, which is usually insoluble, is transformed into albumoses. The latter are not absorbed, however. The albumoses all pass down into the intestines where they meet the pancreatic juice and are split into short chains of two or three amino-acids each, and partly entirely to free amino-acids. That free amino-acids constitute a considerable part of the products of intestinal digestion was demonstrated by Abderhalden, who isolated most of the known amino-acids from intestinal contents. White and Van Slyke have shown that the entire mass of products, aside from the

[1] These analyses are combinations of what appear to be the best determinations of various chemists.

free amino-acids, consists of short chain peptids. Finally, either before or after entering the intestinal wall, the products encounter a third hydrolytic enzyme, erepsin, which is capable of carrying the hydrolysis to the stage of amino-acids still nearer completion.''

Van Slyke traces the amino-acids through the body as follows: ''Entering the alimentary tract as part of a protein molecule, it is set free by digestive hydrolysis and passes into the portal blood stream. It may be at once picked up by the liver and decomposed into urea, or perhaps synthesized into reserve protein. It may, however, pass by the liver and be absorbed from the blood by one of the other tissues. Here it may remain for a time before being incorporated into the tissue protein. The fact that a considerable store of amino-acids is always found in the tissues is proof that chemical incorporation does not instantly follow absorption from the blood stream. After a period of time, concerning the length of which we are absolutely ignorant, the tissue autolyzes, and the amino-acid returns to the depot of free amino-acids held by the tissue. From this depot it may pass back into the blood, be taken out by the liver, and destroyed. Or it may be reincarnated into a new protein in some other organ.''

The amino-acids have been likened to building stones. The proteins taken into the body as foods in the process of digestion are split into their component amino-acids and these are absorbed and circulate in the blood where they are used by the various tissues for growth and repair. The amino-acids have also been likened to the alphabet, and the various proteins to words. Just as certain letters are necessary to spell certain words, so certain amino-acids are required to form the various proteins. Gelatin contains a large amount of glycocoll, but is lacking in tyrosin and tryptophan. Voit and Munk demonstrated that gelatin could not support nitrogen equilibrium, but it was shown later that by the addition of tyrosin and tryptophan nitrogen equilibrium could be established at least for a short time.

It is evident from experimental work that it must be determined which animo-acids are indispensable and which are not. Some of them can evidently be formed by synthesis in the body, as for example glycocoll. In mammals tryptophan seems to be indispensable and it apparently cannot be formed, or at least not in sufficient amounts in the body.

Osborne and Mendel have studied certain proteins in their relation to the growth of young animals. They failed to induce growth with legumelin (soy bean), vignin (vetch), gliadin (wheat or rye), legumin (pea), legumin (vetch), hordein (barley), conglutin (blue or yellow lupin), gelatin (horn), zein (maize), phaseolin (white kidney bean).

In some of these the failure was evidently due to a lack of certain amino-acids in the diet. The gelatin is explained above and zein lacks tryptophan and lysin. If large amounts of protein are used

Meats.

In 100 grams.	Nitrogen bases in grams.
Beef	0.037
Calf meat	0.038
Mutton	0.026
Pork	0.041
Cooked ham	0.025
Raw pork	0.024
Salmon	0.017
Tongue (calf)	0.055
Liver sausage	0.038
Brunswig sausage	0.010
Mortadel sausage	0.012
Salami sausage	0.023
Blood sausage	
Pig brain	0.028
Liver	**0.093**
Kidney	**0.080**
Thymis	**0.330**
Liver (calf)	**0.052**
Chicken	0.029
Pigeon	**0.058**
Goose	0.033
Deer	0.039
Young pheasant	0.034
Bouillon (100 gm.), Beef tea, boiled two hours	**0.015**
Fish.	
Shellfish	0.039
Tench	0.027
Cod fish	0.038
Eel	0.027
Salmon (fresh)	0.024
Carp	0.054
Perch	0.045
Pike	0.048
Red herring	0.028
Herring	**0.069**
Trout	0.056
Sprat	**0.082**
Oil sardines	**0.118**
Sardellen	**0.078**
Anchovies	**0.145**
Crabs	0.020
Oysters	0.029
Lobster	0.022
Eggs.	
Hen's eggs	0
Caviare	0
Milk and Cheese.	
Milk	0
Edam cheese	0
Schweitzer cheese	0
Limburger cheese	traces
Tilsit cheese	0
Roquefort	0
Gervais	0
Cream cheese	0.005
Kuhkäse	0.022

Vegetables.

In 100 grams.	Nitrogen bases in grams.
Cucumber	0
Salad	0.003
Radishes	0.005
Cauliflower	0.008
Cabbage	0.007
Chives	traces
Spinach	**0.024**
White cabbage	0
Carrot	0
Kale	0.002
Curly cabbage	0.002
Rampion	0.011
Kohlrabi	0.011
Celery	0.005
Asparagus	0.008
Onions	0
Green peas	0.002
Potatoes	0.002
Mushrooms.	
Steinpilz	**0.018**
Pfefferlinger	**0.018**
Mushrooms	0.005
Morel	0.011
Fruit.	
Bananas	0
Pineapples	0
Peaches	0
Grapes	0
Tomatoes	0
Pears	0
Plums	0
Preisel berries	0
Oranges	0
Apricots	0
Blueberries	0
Apples	0
Almonds	0
Hazelnuts	0
Walnuts	0
Legumes.	
Peas (fresh)	**0.027**
Peas	**0.018**
Lentils	**0.054**
Beans	**0.017**
Cereals.	
Grits	0
Barley	0
Rice	0
Tapioca	0
Sago	0
Oatmeal	0
Millet	0
Bread.	
Rolls	0
White bread	0
Koumiss bread	0
Pumpernickel	0.003

certain deficiencies may not be apparent, but these appear on restricting the amounts. Eventually the nature and functions of the various amino-acids may be sufficiently well known to definitely influence human dietetics. This, and the observations on vitamins make the desirability of a mixed diet of fresh foods plain.

The amino-acids may be acted upon by the intestinal bacteria with the formation of indol, skatol, and other substances which may be highly poisonous. These are most likely to be formed in diseases like cholera, summer diarrhea, and the like. Ptomaine poisoning is of this nature. Carbohydrates may be formed in the body by the synthesis of certain of the amino-acids.

In some diseased conditions some of the amino-acids may be excreted in the urine, as the proteins are disintegrated faster than the amino-acids can be metabolized. In acute yellow atrophy of the liver and in phosphorous poisoning leucin, tyrosin, glycocoll and phenylalanin may be found. In some other conditions the body loses the power to deaminize and oxidize one or more of the amino-acids, as in alkaptonuria. (See also Acidosis.)

Purin Metabolism (see also Gout).—Some years ago the proteins containing C_5N_4 began to attract attention. These substances are called the purin bases, and are a series of compounds called adenin, guanin, hypoxanthin, xanthin, and uric acid. These substances occur in foods, such as liver, pancreas, and meats, in which they or their precursors are in the nuclear protein. They also are found in legumes and certain other foods.

A man on a diet free from purin excretes 0.3 or 0.4 gram of uric acid daily. This is formed from the breaking down of the nuclei, and is called the endogenous purin. That which is in the body as a result of metabolism of food is called exogenous purin. This latter, of course, can be regulated to a large extent by the proper selection of the diet. Those purin bases are difficult of excretion, and in certain diseases there may be purin retention if the amount is too high (see Gout). In certain other diseases (as nephritis) it is a good thing to lessen the intake of purin bases. Normally, on an unrestricted diet, from 1 to 3 per cent. of the total nitrogen excreted is in the form of uric acid.

Various tables will be found in the article on Gout, and the table on page 69, from Messan and Schmid, is one of the latest contributions on the subject.[1] The foods to be especially noted on account of their purin content are printed in bold type.

The Specific Dynamic Action of Protein.—This may be briefly mentioned here, and is one of the many curious and as yet unexplained features of metabolism. Each form of food excites a specific action in metabolism—that is, there is a certain amount of heat or energy derived from each form which is lost and not used by the body.

[1] Therapeutische monatsheft, Berlin, 1910, xxiv., No. 3.

Thus, if protein carbohydrate or fat are fed separately to cover a given requirement, about 30 or 40 per cent. more protein would be required, about 14 to 15 per cent. of fat, and about 6 or 7 per cent. of carbohydrate. The protein raises the metabolism through some specific action. On a mixed diet this is not so important. This effect of the food-stuffs or the loss of energy may be calculated by using factors determined by Rubner. For protein 30.9, fat 12.7, and carbohydrate 5.8. In a given diet the percentage of protein, fat and carbohydrate should be multiplied by 0.309, 0.127, and 0.058 respectively to determine the energy percentage lost. Practically, in a mixed diet this amounts to a little over 10 per cent. above the food requirements of starvation. Thus, a man fasting metabolized 2400 calories, if a mixed diet containing 19.2 per cent. of protein is given, a total of 2745 calories would be required to maintain the individual. If a smaller percentage of protein is given in the food, a somewhat smaller total requirement will be needed. Rubner advises a restriction of proteins in fever and in hot weather and climates on account of this specific dynamic action of protein.

The Amount of Fat and Carbohydrate.—There is some little difference of opinion on this subject. While it would not be well under ordinary conditions to omit from the diet either all the carbohydrate or all the fat, as a matter of practical experience on a mixed diet, the exact amount of fat and carbohydrate does not make so very much difference as long as the total number of calories needed to be supplied in addition to that supplied by the protein is covered. Voit's standard was 56 grams of fat and 500 of carbohydrate. Playfair, in England, reduced the fat to 51, and increased the carbodydrate to 531. Gautier, in France, suggests 65 grams fat and 437 carbohydrate. Fat is expensive as a food, and, from an economic standpoint, diets containing over 60 grams are not apt to be employed. In cold weather the amount ingested may be increased if desired, and persons doing very hard physical labor can take more. If fat does not agree, an amount of carbohydrate having an equal caloric value may be substituted for whatever fat is omitted. Fat-free diets are not advisable either in infants or young children. (See Rickets.)

The amount of carbohydrate used will depend on the total number of calories needed, and can be determined by deducting the proteins and fats. A diet consisting largely of carbohydrate is objectionable chiefly on account of the bulk and the strain made in the digestive organs.

Mineral Metabolism.—After the fundamental facts concerning the metabolism of protein of fat and carbohydrate had been ascertained, it was quite natural that the metabolism of the mineral elements in the food should come in for a large share of attention. It is now possible to determine the intake and output of iron, calcium, magnesium,

phosphorus, potassium sodium, chlorin, and sulphur. The chief facts concerning mineral metabolism will be found under the heading of Salts.

Sherman has suggested as a standard that in a diet containing 2500–3500 calories with a protein content of 75 grams the phosphorous content should be 1.44 grams (about 3.5 grams P_2O_5) the calcium 0.69 gram (estimated as Ca O) and iron 15.0 milligrams (0.015 grams).

DIETARIES AND DIETARY STANDARDS

Food Economics.—The cost of foods is most important and the physician should bear this in mind in ordering diets and suit the suggestions or orders to the pocketbook of the consumer. The United States Government is doing much to enlighten the people on the relation of food values to cost, but the poor who need such information seldom have it furnished them or are too ignorant to use it. Perfectly satisfactory diets may be arranged at a reasonable cost under normal conditions, while high priced meals may not be as suitable or even have as high nutritive value. The added cost usually, not always, brings an added flavor or choiceness of food. A study of food values to the actual cost should be made by anyone having to cater to a family or institution. In a general way local food products are cheaper than those which have to be shipped and non-perishable foods than the perishable. Vegetables and cereals are cheaper than meats. Milk, bread and butter are also cheap when one considers their food value. Too much stress should not be laid on the number of calories, as many fresh fuits and vegetables extremely important in furnishing bulk, vitamins and salts may have a high cost based on caloric values, but not really be expensive. The waste in food should also be considered, as many cheap cuts of meat and other foods may have such a large proportion of unavailable material as to more than offset the difference in price. What has been said under the subject of Superior and Inferior Food Proteins, is interesting in this connection.

Sherman and Gillett (Publication 121, New York Association for Improving the Condition of the Poor, 1917) suggest that if city dwellers spend an equal amount for (1) meat, (2) milk, (3) fruit and vegetables, the result will result in a nearer approach to a well balanced dietary. They studied 92 families and the results are instructive. Their table is shown on p. 73.

"It is clearly evident that the average expenditure in Group I was too low to provide sufficient energy for that group. If, however, the cost and food factors for each group be recalculated in proportion to 3,000 calories we have a basis for comparison which indicates: (1) that if energy be sufficient the other food factors will on the average be adequately supplied, and (2) that Group I was getting practically the same amount of food value for 26 cents for which Group IV was paying 45 cents. It should also be noted that while only one-fourth

Average Distribution of Expenditure Among Various Types of Food in 92 Families (Divided into 4 groups on the Basis of Cost per Man per Day).

	Group I	Group II	Group III	Group IV
Cost per man per day	19.2 cents	28.2 cents	34.7 cents	49.4 cents
Cost per 3000 calories	26.1 cents	30.3 cents	34.3 cents	44.7 cents
TYPE OF FOOD		PERCENTAGE	DISTRIBUTION	
	Per cent.	Per cent.	Per cent.	Per cent.
Meat-fish	36.8	29.4	34.9	31.8
Eggs	4.5	6.4	5.4	5.9
Milk	9.1	9.2	7.8	8.4
Cream	0.3	0.2	0.1	1.2
Cheese	0.9	1.6	0.8	1.2
Fats	6.7	8.1	7.9	9.8
Grain products	22.6	17.7	17.9	13.1
Sugars	3.4	4.4	3.8	3.6
Vegetables	9.0	9.0	9.2	9.3
Fruit	2.3	7.2	6.4	8.2
Nuts	0.1	0.6	0.1	0.6
Miscellaneous	4.3	6.2	5.7	6.9
		FOOD VALUE PER	MAN PER DAY	
Calories	2043	2665	3106	3889
Protein	78 grams	91 grams	109 grams	126 grams
Phosphorus	1.14 grams	1.39 grams	1.60 grams	1.95 grams
Calcium	0.51 gram	0.64 gram	0.72 gram	1.01 grams
Iron	12.1 milligrams	14.9 milligrams	17.7 milligrams	20.6 milligrams
		FOOD VALUE PER	3000 CALORIES	
Protein	107 grams	104 grams	102 grams	116 grams
Phosphorus	1.59 grams	1.57 grams	1.54 grams	1.69 grams
Calcium	0.70 gram	0.77 gram	0.71 gram	0.81 gram
Iron	16.7 milligrams	16.7 milligrams	17.1 milligrams	17.9 milligrams

were spending for food less than 25 cents per man per day, about 50 to 75 per cent. were not getting enough energy."

The proportion of the income to be spent in food has been studied by the Russell Sage Foundation, and they suggest the following for a family of mother, father and three children:

Proportion of Income to Be Spent for Food.

Income per year.	Percentage for food per year.	Total for food per year.	Amount per day for family of five.	Amount per day per person.
$ 500	55.0	$275	$0.75	0.15
800	45.6	365	1.00	.20
1000	45.0	450	1.20	.24
1100	45.0	490	1.34	.27
1200	44.6	540	1.48	.29 +
1500	36.8	552	1.50	.30
2000	30.0	600	1.64	.33

Planning Diets.—A perfectly balanced ration is one which takes into consideration the following factors. Our ideas of the completeness of a diet are constantly changing as the study of nutrition is making clear many little understood points. The easiest way to work out a dietary is to determine according to the data already given the number of calories required. Of this amount from 10 to 15 per cent. (from 60 to 120 grams for an adult) should be furnished by protein. Sedentary and indoor people require less than active outdoor ones. The nature of the proteins should be considered and those containing

the requisite amounts of the necessary amino-acids should be included. The relative value of some of the proteins are given under the paragraph on Superior and Inferior Proteins. The proteins found in milk and meat are more valuable than the ones in vegetables. The remainder of the calories are to be made up in fat and carbohydrate. These are interchangeable within certain limits. It has been stated that on a basis of caloric values the proportion of fats to carbohydrates may vary as widely as 7 to 2. In cold weather and climates and in hard work the fat may be increased. As a matter of fact fat is expensive so that the amounts taken in are small, as a rule, 25 to 75 grams a day, and the balance in carbohydrates. In hot weather and climates and for sedentary people carbohydrates are used in larger proportions.

The diet must also contain a full amount of the various salts needed in metabolism and on a generous mixed diet this will always be the case, but on a restricted diet the salts may be so low as to interfere with nutrition. The only mineral constituents that have been sufficiently studied to know about the requirements are iron 0.015 gm. daily, calcium C_aO. 0.70 gm. daily and phosphorus $P_2\ O_5$ 2.75 gm. average daily. Iron containing foods of great value are spinach, lettuce, asparagus, and similar things, the legumes, yolk of egg and meat. Calcium containing foods of greatest value are milk, cheese, cauliflower, string beans, carrots, lettuce, rhubarb, oranges and lemons. The phosphorus containing foods of greatest value are skimmed milk, milk, cheese, legumes, meat, yolk of egg, oatmeal, cauliflower, spinach, lettuce, asparagus, green peas and beans, and tomatoes. With ordinary diets the requirements are easily met and this emphasizes the importance of milk, fruits, salads, and other green vegetables. It is also important that the foods furnish more bases than acids (see Alkalis and Acids), and meats, cereals, and other acid forming foods should be offset by those containing alimentary alkalis, as potatoes, bananas, and other vegetables and fruits.

Certain important substances occur in animal fats which should always form a part of the diet, such as fat from meats, butter and cream. Vitamins are also important and seem to bear a relation to the phosphorous content of the food and diets low in phosphorous should have their content increased by fresh or dried (not canned) legumes, the whole grains of cereals, etc. (See Vitamins.) There should always be an anti-scorbutic in the diet, such as some fresh fruit or vegetable. The increased use of sterilized canned foods makes this imperative. The food should be such as contains sufficient bulk. Among the well-to-do, as a rule, the ordinary daily diet naturally includes all the necessaries, but among the poor and ignorant and in institutions and where large numbers of persons are fed together, grave errors of diet may lead to serious diseased conditions. (See also Basic Quantity Food Tables.)

Vitamins.—Of recent years it has become evident from nutrition experiments that growth and life is more than supplying the animal body with certain amounts of protein, carbohydrate, and fats. This important subject is discussed further on under the same heading.

Acids and Alkalis.—The question of acids in base-forming properties of food is extremely important and is being studied to advantage (see also Acidosis and Mineral Salts). There is still a great deal of confusion as regards the composition of the various food materials, the older studies taking into account either the whole plant or the product and were made by agricultural chemists whose chief interest was in what was taken out of the soil. The newer studies have dealt with the composition either of the food as purchased or of the edible portion or as prepared for the table and, in many instances, the tables did not show which particular preparation of food was analyzed. This is, however, being rapidly corrected. In this connection the work of Sherman and Gettler (Journal of Biological Chemistry, 1912, xi, p. 323) and Sherman (Food Products) is of great interest, the latter work containing full tables showing the content based on hundred calorie portions. This basis is rather better for practical use than a hundred gram basis, inasmuch as differences in the water content in the latter yield differences in the figures. By estimating the difference between the acid ash and the basic ash of the foods it may be determined whether they will increase the acidity of the body or decrease it. Foods furnishing acids are chiefly meats, eggs, grain products, particularly the whole grains, and peanuts. Plums, prunes, and cranberries, although yielding a basic ash, increase the acid formation owing to the benzoic acid content. Milk is regarded as either neutral or slightly basic, while most of the alkalis are furnished by fruits and vegetables and, as Blatherwick has shown, potatoes, oranges, raisins, apples, bananas and lettuce are very useful in reducing the acid output. Tomatoes are of less value.

The actual computations are scarcely ever made outside of very careful dietetic studies, but when it is thought advisable to increase the bases taken in a food, those foods are added to the dietary. In any well balanced ration the proportion of alkali furnishing foods should balance the ones furnishing acids. Sherman suggests computing this then in terms of normal solutions and that it is preferable to have the balance on the basic side and that an excessive acid-forming element be permitted. It would seem that the excess should not exceed 25 units of the equilibrium of the man per day, which is about the quantity neutralizable by the amount of ammonia to be expected in a day's urine under favorable conditions. The following table from Sherman and Gettler shows the acid or base excess value of the foods most commonly used:

Excess of Acid-Forming or Base-Forming Elements.

Article of Food.	Excess Acid or Base in Terms of Normal Solutions.			
	Per 100 grams.		Per 100 calories.	
	Acid. c.c.	Base. c.c.	Acid. c.c.	Base. c.c.
Almonds		12.38		1.86
Almonds		11.76		1.76
Apples		3.76		5.98
Asparagus		0.81		3.65
Bananas		5.56		5.62
Beans, dried		23.87		6.92
Beans, dried		11.58		3.36
Beans, lima, dried		41.65		12.08
Beets		10.86		23.57
Cabbage		4.34		13.76
Cabbage		7.10		22.51
Carrots		10.82		23.91
Cauliflower		5.33		17.48
Celery		7.78		42.17
Cherry juice		4.40		
Chestnuts		7.42		3.19
Corn, sweet, dried	5.95		1.77	
Crackers	7.81		1.95	
Currants, dried		5.97		1.85
Eel	9.89			
Eggs	11.10	7.55		
Egg white	5.24		9.52	
Egg yolk	26.69		7.08	
Fish, haddock	16.07			
Fish, pike	11.81			
Lemons		5.45		12.32
Lettuce		7.37		38.69
Meat, beef, lean, I	13.91		12.10	
Meat, beef, lean, II	10.50		8.74	
Meat, beef, lean	12.00		10.44	
Meat, beef, lean	13.67		11.89	
Meat, chicken	17.01			
Meat, frog	10.36			
Meat, pork, lean	11.87			
Meat, rabbit	14.80			
Meat, veal	13.52			
Meat, venison	15.83			
Milk, cow's		2.37		3.44
Milk, cow's		1.26		1.83
Muskmelon		7.47		18.82
Oatmeal	12.93		3.23	
Oatmeal	10.63		2.66	
Oranges		5.61		10.94
Peaches		5.04		12.20
Peanuts	3.9		0.70	
Peas, dried		7.07		1.98
Peas, dried		3.36		0.94
Potatoes, I		7.19		8.63
Potatoes, II		5.5		
Potatoes		7.72		9.26
Prunes		24.40		8.05
Prunes		25.55		8.43
Radishes		2.87		9.79
Raisins		23.68		6.87
Raspberry juice		4.91		

Article of Food.	Excess Acid or Base in Terms of Normal Solutions.			
	Per 100 grams.		Per 100 calories.	
	Acid. c.c.	Base. c.c.	Acid. c.c.	Base. c.c.
Rice, I	8.1		3.35	
Rice, II	7.08		2.05	
Rice	8.35		2.42	
Turnips		2.68		6.86
Turnips		6.80		9.41
Wheat, entire	9.66		3.25	
Wheat, entire	12.39		3.47	
Wheat, flour	11.61		2.70	

The Calculation of Rations.—Numerous suggestions, tables and devices have been offered. In army and navy life and in ordering food for large numbers of people certain standards are used, constructed more with the view of satisfying the appetite than any theory of metabolism. Practically they work out about as above, and usually contain about 100 to 125 grams protein, 50 to 65 grams fat, and the balance up to about 3500 calories or more in carbohydrate. The tables of foods ordinarily used are arranged so at a glance the amount needed for any number of "rations" or people may be told. In the army conversion tables these figures show the amount needed for one and any number up to 100,000. For the purveying of food such tables are of great help. Tables showing the comparative cost of foods and their full value are of use in supplying a nutritious diet on as cheap a basis as possible. This economic side of diet is of the greatest importance, and one well worthy of the study of physicians and laymen. (See also Basic Quantity Food Tables.)

A Food Scale.—Hart has devised a food scale which makes it comparatively easy for the patient to weigh his food for himself, a very important factor for the treatment of patients who are on strictly regulated diets. The majority of these patients cannot afford nor will they tolerate the presence of a trained attendant and most of them are not sufficiently ill to be in a hospital. Hart gives the following description of his scale: "This is an accurate spring scale of modest dimensions, 6 inches high and with a 5 inch base, finished in nickel and, therefore, not too conspicuous to be used at the table. It is fitted with a broad circular plate which easily supports the dish on which the food is weighed and it has a base sufficiently wide to keep the scale from being easily upset. The scale is made to indicate grams, having a total capacity of 1000 grams, the dial being figured for every 100 grams, with subdivisions indicating 20 grams each. By a special contrivance the dial can be quickly rotated to any desired point, by means of a small knob. The result is that the zero point can be brought easily to any position desired.

"The method of using the scale is as follows: Suppose the food prescription for a given meal consists of

Meat	100 grams
Potatoes	80 grams
String beans	120 grams
Wheat bread	60 grams

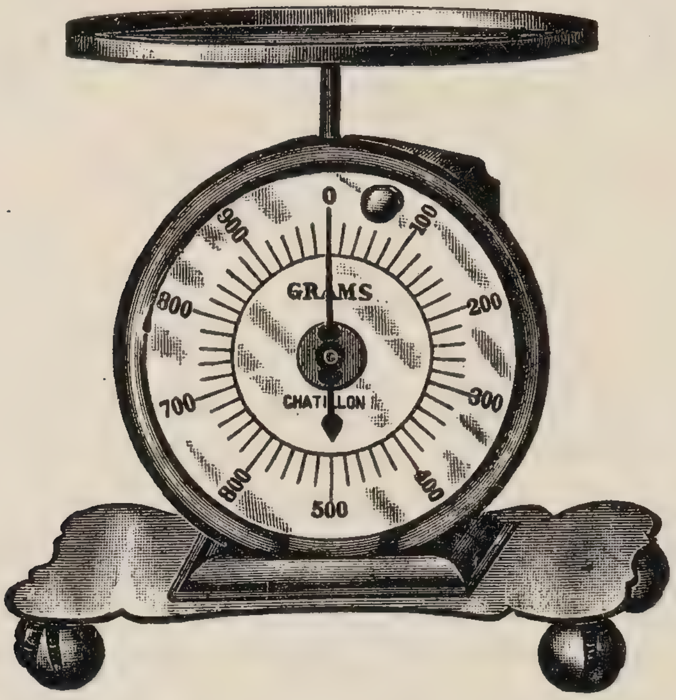


Fig. 1.—A food scale with an adjustable dial.

"An empty plate is placed on the scale and by means of the knob the dial is rotated until the zero point is opposite the end of the pointer; meat is placed on the plate until the pointer indicates 100 grams; the dial is again rotated until zero is opposite the pointer; potato is added until 80 grams are indicated, and so on, the zero point on the dial each time brought opposite the pointer until at the completion of the operation we have on the plate all the food for the meal, each kind of food accurately weighed." (Jour. Am. Med. Assn., August 7, 1909, liii, 457.)

After two or three weeks the patient can learn to judge by the eye the size of a piece of meat or bread or other food which he is allowed and in some instances the use of the scales can be done away with after this has been thoroughly mastered.

The Prescribing of Diets.—The physician usually deals with the individual and the individual diet, and there is a growing demand for the scientific supervision of diet in health and in disease. Many physicians get hopelessly entangled, and finally fall back on set diet lists. To be able to understand the prescribing of food one must know certain facts and figures and be familiar with the values of simple foods in the amounts usually eaten. The number of calories furnished by the protein, fats, and carbohydrates in any given food must also be known, so that diet may be varied to suit the individual need. Facility in this may be acquired easily by calculating from the tables given below the food actually eaten by the physician himself. The weighing of the amounts served is the most accurate, but after a few times the amount may be judged by the eye. The totals will always be only

approximate, but sufficiently accurate for the purposes of medical practice. The terms "a moderate helping," etc., mean little unless the portions have been checked up by actual weighing.

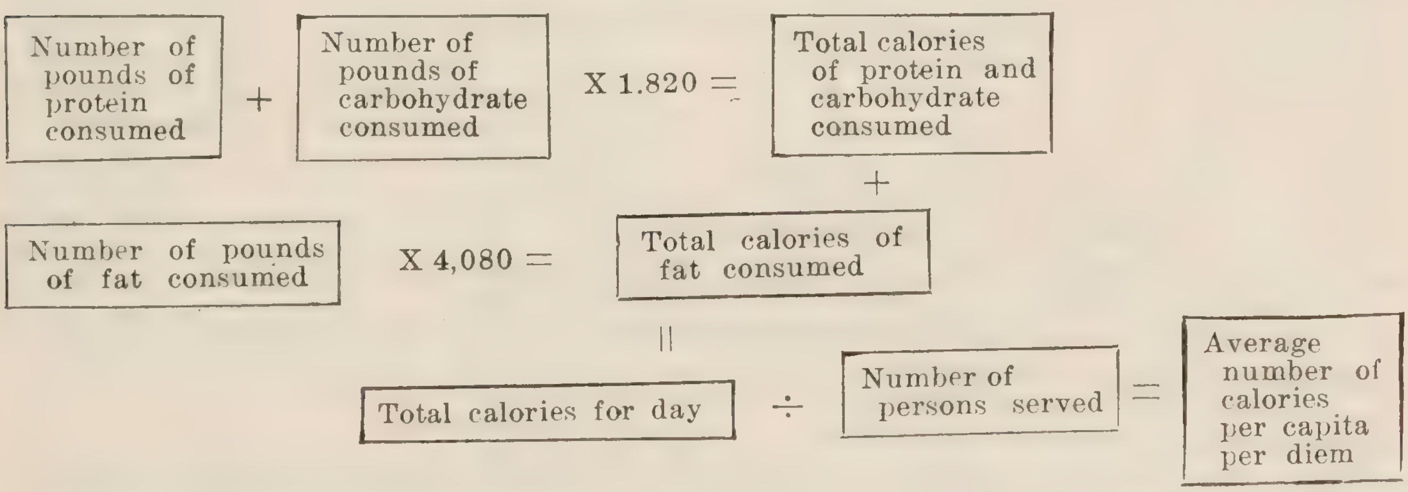
The following facts must be learned, and should be copied on a card and carried about until they are memorized:

1 gram protein	= 4.1 or 4 calories	approximately.
1 gram fat	= 9.3 or 9 calories	approximately.
1 gram carbohydrate	= 4.1 or 4 calories	approximately.
1 gram alcohol	= 7.	

	Food required daily. Calories. Per pound.	Calories. Per kilo.	For man 65 kilos or 154 pounds. Total calories.
Rest in bed	14	28	1800
Repose	16	32	2100
Light work	17	33	2300
Moderate work	20	40	2600
Hard work	24	48	3100

The protein requirement is approximately 1 to 2 grams per kilo or ½ to 1 gram per pound of body weight, giving an average of from 60 to 120 grams for a man of 65 kilos or 154 pounds. These are the minimum and maximum under ordinary conditions. In actual dieting, unless especial care is taken, the protein will increase with the increase in calories on a general mixed diet. If the individual is doing hard work and is in good health, this does not apparently affect the general well being. If the caloric value of a food per pound is known, dividing by 4.5 will give the approximate number of calories per 100 grams; or if the value per hundred grams is known multiplying this by 4.5 will give the caloric value per pound.

To compute easily the number of calories in a diet, or to prescribe it, several methods have been suggested. Wilson and Rathburn (Journal American Med. Assn. June 3, 1916, 1760,) give the following scheme to help in computing the calories in a dietary. Irving Fisher



Diagrammatic scheme for computing the caloric content of a dietary. Pounds are converted into grams by multiplying by 453.5925 or roughly 454.

has compiled the table given below, showing the amounts of foods in common use necessary to equal 100 calories; by combining the amounts

the total number of calories can easily be obtained. This is a simple method of prescribing diets, but less useful in determining the value of a given diet, unless it has been served in standard portions or fractions of such portions. This method is admirably suited where there is some one to superintend the serving, as in sanitariums, in hospitals where the food is served from a diet kitchen, and in private homes where there is a trained nurse. The patient or nurse writes down the name of the article and the amount of protein eaten, and by using the table the food value is easily ascertained, as follows:

	Protein.	Fat.	Carbohydrate.
1 portion boiled fat beef	40	60	
1 " baked potato	11	1	88
1 " corn	13	10	77
1 " bread	13	6	81
1 " apple	3	7	90
Total calories, 500	90	84	336

With this Fisher has arranged a graphic method of representing these values, full details of which will be found in the Journal of the American Medical Association, vol. xlvii., No. 20, November 7, 1906.

Tracy (New York Medical Journal, Jan. 13, 1917. 75.) has constructed a plan and some tables based on Locke's tables which makes the selection of a balanced ration a comparatively easy matter and avoids the necessity of computing. The protein content of these diets is very low and the meat portions might well be increased except for the sedentary. Tracy's method is as follows:

Bearing in mind the two main requirements for the daily diet, namely, that it shall contain approximately 65 grams of protein with 2,500 total calories, or 75 grams of protein with 3,000 total calories, these tables have been made to include only data as to the weight of protein and the total fuel value of the foodstuff. Since multitudes of figures are in themselves a bewilderment to one unaccustomed to their use, it is believed advisable to eliminate as many unessential figures as possible.

In tables as brief as these, undoubtedly there will frequently be noted the omission of a vegetable or a dessert, or other food article which is desired for a particular menu, but by reference to the Locke or Gephart tables such an article can be looked up as occasion demands and added in its proper place according to the amount of protein and total fuel value. Thus, according to the family tastes, the tables may be enlarged from time to time.

In order to bring together portions which are comparatively uniform as regards protein or fuel content, the portion as described by Locke is in some instances modified by a qualifying word, large or small, and the analytical figures changed by a corresponding definite percentage increase or decrease. Wherever this has been done the sign (†) is placed before the name of the article. Thus the quantities suggested

for a portion are approximate only, but, it is believed, are sufficiently uniform to constitute a basis for every day planning of the household meals. A little larger portion on one day will undoubtedly be balanced by a smaller portion on another day, and great accuracy is not necessary. A weekly ration of 17,500 calories is without doubt quite as satisfactory as a daily ration of 2,500 calories for seven days.

In using these tables the following simple rules will readily lead to the combinations of food materials which will supply the nutritive requirements and add the desirable variety to the daily menus.

1. For the heaviest meal of the day—dinner—select one article from each of Tables I, II, and III.

2. For luncheon, or supper, select one article from each of Tables II, III, and IV.

3. For breakfast select one article from each of Tables III, IV, and V.

4. Add together the protein values and determine what addition of protein is needed to complete the daily requirement.

5. Add together the total calorific values, and to this total add 600 calories, which will be incidentally taken during the day in accessories, as sugar, cream, butter, sauces, etc. (Table IX.) Determine what fuel value must be added to bring the total for the day up to the requirement.

Table I.

Meats, Poultry, Fish. †—modification of Locke's "portion."

High Protein Foods.—Only one article from this table should be served at a meal, and preferably only once a day.

Food Article.	Portion	Protein Grams.	Total Calories.
Section A			
†Beef, roast	1 small slice	Rough average 21 grms.	Rough average 265 cals.
Beef, steak	1 slice		
†Chicken, fricassee	large helping		
†Lamb, roast	1½ slices		
Lamb, chops	1 average chop		
†Mutton, roast	3 slices		
†Ham, boiled	large slice		
†Turkey, roast	small slice		
†Salmon	large helping		
†Mackerel	double helping		
Section B			
Beef, scraped (round)	4 in. pat		Rough average 130 cals.
†Chicken, roast	small helping		
Mutton, chops	1 chop		
Mutton, boiled	1 slice		
†Pork, roast	small slice		
†Pork, chops	1 large chop		
Veal, roast	1 slice		
†Bluefish	small helping		
Codfish	average helping		
Halibut	average helping		
Spanish mackerel	average helping		
†Clams (long)	10 clams		
†Crab, hard shell	1 large crab		

6. Supplement the protein and fuel as may be indicated by the necessary additions, according to taste, and to any meal desired, of articles from one or more of Tables IV to VIII.

7. Do not let the daily protein run above 75 grams for any length of time. The total fuel value of the food may run above 2500 or 3000 calories without harm, especially in cold weather, unless one tends to become excessively fat.

8. Remember that the total fuel value of the ration must be increased if very active or severe muscular work is to be done, and see to it that such active worker receives double or triple portions of the food articles provided.

9. After the occasional feast day, which will do no harm to a vigorous digestive tract, eat a little less for a day or two until the weekly balance is struck.

By such use of the tables a general appreciation of the nutritive value of the common foodstuffs will be acquired in a remarkably

TABLE II.

Green Vegetables.—Low fuel and protein value (exception, corn). Valuable for salts, vitamines, and bulk. At least one article from this table should be included in the day's ration.

Food Article.	Portion	Protein Grams.	Total Calories.
Squash	2 heap. tablesps.	1.3	Rough
Spinach	2 heap. tablesps.	2.1	average
Tomatoes, raw	1 average size	2.4	55 cals.
Tomatoes, cooked	3 heap. tablesps.	1.2	
Asparagus, canned	average helping	1.8	Rough
Beets	2 heap. tablesps.	1.6	average
String beans	3 heap. tablesps.	0.7	20 cals.
Carrots	3 heap. tablesps.	0.5	
Cabbage	3 heap. tablesps.	0.6	Rough
Cauliflower	2 heap. tablesps.	1.0	average
Turnips	2 heap. tablesps.	0.4	7 cals.
Corn, green boiled	1 ear	3.5	140 cals.

Any of the above articles used as salad with mayonnaise dressing will be increased in fuel value by 187 calories.

Cream sauce added in serving any of the above articles will increase the fuel value by 91 calories.

TABLE III.

"Starchy" vegetable foods. High fuel value (carbohydrate).
Low Protein.—Only one article from this table should be used at a meal.

Food Article.	Portion	Protein Grams.	Total Calories.
Potatoes—white			
Baked	1 medium size		
Boiled	1 medium size		
Creamed	4 heap. tablesps.	Rough	Rough
†Mashed	3 heap. tablesps.	average	average
Potatoes—sweet boiled	1 small size	3.5 grms.	140 cals.
†Rice, boiled	1½ heap. tablesps.		
Macaroni, boiled	3 heap. tablesps.		

short time, and the housewife in planning the meals for the day, or the individual selecting his or her own food in a restaurant, will by second nature, or with an educated common sense, find no difficulty in meeting the nutritive requirements without special thought as to protein or calories.

TABLE IV.

Foods containing moderate protein of animal origin.
Two articles from this table may be used at the same meal, but preferably not with articles from Table I.

Food Article. Section A	Portion	Protein Grams.	Total Calories.
Egg, boiled	1 egg		
Egg, raw	1 egg		
Milk, skimmed	1 glass		
Buttermilk (from churn)	1 glass		Rough average 80 cals.
American cheese	1 cu. in.		
Cream cheese	1 cu. in.		
Chicken sandwich	1 sandwich		
Ham, fried	average portion		
Sardines, canned	3 fish		
Oysters, raw	9 oysters		
Whole milk	1 glass		
Omelette, 3 eggs	1/3 omelette	Rough average 7.2 grms.	Rough average 150 cals.
	3 tablesps. milk		
	1 heap. teasp. butter		
Meat stew	average helping		
Custard pudding	2 heap. tablesps.		
Sausage, country	1 large sausage		
Bacon	2 slices		
Ham sandwich	1 sandwich		
Cream toast	2 slices with 5 tablesps. sauce		Rough average 300 cals.
Macaroni, baked with cheese	1 tablesp		
†Custard pie	1/5 pie		
Mince pie	1/6 pie		

Section B.—Foods containing moderate protein of vegetable origin. Two articles from this table may be used at the same meal. Useful with or without articles from Table I to raise the protein ration up to the requirement.

Food Article.	Portion	Protein Grams.	Total Calories.
Baked beans, canned	3 heap. tablesps.		
Lima beans	2 heap tablesps.		Rough average 140 cals.
Green peas	4 heap. tablesps.		
†Peanuts	20 nuts		
†Brazil nuts	7 large nuts		
†Pecans	20 large nuts		
Walnuts	10 nuts	Rough average 7.2 grms.	
Cocoa	1 cup		Rough average 300 cals.
1 heap. teasp. cocoa			
1 heap. teasp. sugar			
3/4 cup milk			
1 tablesp. cream			

TABLE V.

Breadstuffs and Cereals—High fuel value (carbohydrate) with low protein.

Section A—Breadstuffs. Useful additions to every meal in twice and three times the portion given.

Food Article.	Portion	Protein Grams.	Total Calories.
Corn bread	Slice 3 x 2 x ¾ in.	Rough average 3.0 grms.	Rough average 100 cals.
White bread, baker's	Slice 3½ x 3 x ½ in.		
White bread, homemade	Slice 3 x 4 x ½ in.		
Vienna roll	1 roll		
Biscuit, homemade	1 biscuit		
Graham bread	Slice 3¾ x 2¾ x ½ in.		
Whole wheat bread	Average slice		
†Graham crackers	3 crackers		
†Saltines	8 crackers		
†Butter crackers	6 crackers		

Section B—Cereals. Only one article from this table should be used at a meal.

Food Article.	Portion	Protein Grams.	
†Oatmeal, boiled	3 heap. tablesps.	Rough average 2.8 grms.	Rough average 100 cals.
Shredded wheat	1 biscuit		
Indian meal mush	3 heap. tablesps.		
Hominy, boiled	2 heap. tablesps.		

Sugar and cream on cereal will add 250 calories.

TABLE VI.

Nutritious Soups—High fuel value due to carbohydrate and fat. Low protein. Useful to increase the fuel value of any meal. When one of these is selected a fruit dessert is desirable.

Food Article	Portion	Protein Grams.	Total Calories.
Mock turtle soup	4 oz.	6.2	Rough average 55 cals.
Chicken soup, homemade	3 oz.	9.1	
Bean soup, homemade	4 oz.	3.8	
Cream soups:			
Asparagus	4 oz.	3.4	Rough average 125 cals.
Celery	4 oz.	3.0	
Corn	4 oz.	3.7	
Potato	4 oz.	2.8	
Tomato	4 oz.	2.9	
Pea	4 oz.	6.2	

Note.—Clear soups are of low fuel value, and useful merely as stimulants to flow of digestive juices.

TABLE VII.

Desserts—Protein negligible to moderate. Fuel value high (carbohydrate). Useful food articles to bring the fuel value of day's rations up to the requirements.

Food Article.	Portion	Protein Grams.	Total Calories.
Tapioca pudding	3 heap. tablesps	5.8	
Ice cream	2 heap. tablesps.	5.2	
Doughnuts	1 doughnut	2.4	Rough average 165 cals.
Fruit cake	Slice 2¾ x 2¾ x ½ in...	1.4	
Sugar cookies	3 cookies	2.3	
Apple pie	⅙ pie	3.9	
Squash pie	⅙ pie	5.8	
Bread pudding	2 heap. tablesps.	5.5	
Indian meal pudding ..	2 heap. tablesps.	9.0	Rough average 275 cals.
Orange ice	2 heap. tablesps.	0.9	
Gingerbread	Slice 2 x 3 x 1 in.	3.4	
Chocolate layer cake ..	1 average slice	4.3	

TABLE VIII.

Fruit—Fuel value high to moderate (carbohydrate), protein negligible. Useful additions to any and every meal on account of organic acids, salts, and vitamines.

Food Article.	Portion	Protein Grams.	Total Calories.
Banana	1 average size	1.5	
Grapefruit	½ large size	2.3	
Apple, baked	1 large apple	0.6	Rough average 135 cals.
†Apple sauce	2 heap. tablesps.	0.2	
Cranberries, stewed	2 heap. tablesps.	0.27	
Rhubarb, stewed	2 heap. tablesps.	0.4	
Apple, raw	1 average size	0.4	
Canteloupe	½ average size	1.4	Rough average 85 cals.
Orange	1 average size	1.5	
†Peach	2 average size	1.2	
Pear	1 average size	0.7	
Blackberries	3 heap. tablesps.	1.3	
Strawberries	4 heap. tablesps.	1.0	Rough average 45 cals.
Raspberries	3 heap. tablesps.	0.8	
Pineapple	2 slices	0.4	

TABLE IX.

Accessories—Moderate to high fuel value (carbohydrate or fat), negligible protein. Commonly used additions to every meal, and can usually be expected to add 600 calories or more to the day's ration without particular calculation. C—Carbohydrate. F—Fat.

Food Article.	Portion	Protein Grams.	Total Calories.
C.-Sugar, loaf	1 cube		29
Loaf	1 domino		25
Granulated	1 heap. teaspoon.		41
C.-Honey	1 tablesp.		101
C.-Maple syrup	1 tablesp.		88
C.-F.-Cream sauce	3 tablesps.		91
F.-Olive Oil	1 tablesp.		121
F.-Mayonnaise dressing	1 tablesp.		187
F.-Cream, average	1 tablesp.		54
Heavy	1 tablesp.		72
Whipped	1 heap. tablesp.		81
F.-Butter	1 average ball		119

Table of Foods, Giving the Weight (in Grams, Ounces, and Rough Measure) of a "Standard Portion" of Each Food and the Number of Calories in that "Portion" in the Form of Protein, Fat, and Carbohydrate.

Name of food.	"Portion" containing 100 calories roughly described.	Weight of 100 calories.		Percentage of—		
		Grams.	Ounces.	Protein.	Fat.	Carbohydrate.
COOKED MEATS.						
[1] Beef, round, boiled (fat), 1099 [2]	Small serving	36	1.3	40	60	00
[1] Beef, round, boiled (lean), 1206 [2]	Large serving	62	2.2	90	10	00
[1] Beef, round, boiled (medium), 1188 [2]	Small serving	44	1.6	60	40	00
[1] Beef, fifth right rib, roasted, 1538 [2]	Half serving	18.5	.65	12	88	00
[1] Beef, fifth right rib, roasted, 1616 [2]	Small serving	32	1.2	25	75	00
[1] Beef, fifth right rib, roasted, 1615 [2]	Very small serving	25	.88	18	82	00
[1] Beef, ribs, boiled, 1169 [2]	Small serving	30	1.1	27	73	00
[1] Beef, ribs, boiled, 1170 [2]	Very small serving	25	.87	21	79	00
[3] Calves' foot jelly, as purchased		112	4.	19	00	81
[3] Chicken, as purchased, canned	One thin slice	27	.96	23	77	00
[3] Lamb chops, boiled, edible portion, average	One small chop	27	.96	24	76	00
[3] Lamb, leg, roast	Ordinary serving	50	1.8	40	60	00
[1] Mutton, leg, boiled, 1184 [2]	Large serving	34	1.2	35	65	00
[1] Pork, ham, boiled (fat), 1174 [2]	Small serving	20.5	.73	14	86	00
[1] Pork, ham, boiled, 1192 [2]	Ordinary serving	32.5	1.1	28	72	00
[1] Pork, ham, roasted (fat), 1484 [2]	Small serving	27	.96	19	81	00
[1] Pork, ham, roasted (lean), 1511 [2]	Small serving	34	1.2	33	67	00
[3] Turkey, as purchased, canned	Small serving	28	.99	23	77	00
[1] Veal, leg, boiled, 1182 [2]	Large serving	67.5	2.4	73	27	00
UNCOOKED MEATS.						
[3] Beef, loin, edible portion, average (lean)	Ordinary serving	50	1.8	40	60	00
[3] Beef, loin, edible portion, average (fat)	Small serving	30	1.1	22	78	00
[3] Beef, loin, porterhouse steak, edible portion, average	Small steak	36	1.3	32	68	00
[3] Beef, loin. sirloin steak, edible portion, average	Small steak	40	1.4	31	69	00
[3] Beef, ribs, lean, edible portion, average	Ordinary serving	52	1.8	42	58	00
[3] Beef, round, lean, edible portion, average	Ordinary serving	63	2.2	54	46	00
[3] Beef, tongue, edible portion, average	Ordinary serving	62	2.2	47	53	00
[3] Beef, juice		395	14.	78	22	00
[3] Chicken (broilers), edible portion, average	Large serving	90	3.2	79	21	00
[3] Clams, round, in shell, edible portion, average	Twelve to sixteen	210	7.4	56	8	36
[3] Cod, whole, edible portion	Two servings	138	4.9	95	5	00
[3] Goose (young), edible portion, average	Half serving	25	.88	16	84	00
[3] Halibut steaks or sec., edible portion, average	Ordinary serving	81	2.8	61	39	00

[3] Liver (veal), as purchased, average	Two small servings	79	2.8	61	39	00
[3] Lobsters, whole, edible portion, average	Two servings	117	4.1	78	20	2
[3] Mackerel (Spanish), whole, edible portion, average	Ordinary serving	57	2.	50	50	00
[3] Mutton, leg (hind), lean, edible portion, average	Ordinary serving	50	1.8	41	59	00
[3] Oysters, in shell, edible portion, average	One dozen	193	6.8	49	22	29
[4] Pork, loin, chops, edible portion, average	Very small serving	27	.97	18	82	00
[3] Pork, ham, smoked, lean, edible portion, average	Small serving	36	1.3	29	71	00
[3] Pork, bacon, smoked, medium fat, edible portion, average	Small serving	15	.53	6	94	00
[3] Salmon (California), ant. sec., edible portion, average	Small serving	42	1.5	30	70	00
Shad, whole, edible portion, average	Ordinary serving	60	2.1	46	54	00
[3] Trout, brook, whole, edible portion, average	Two small servings	100	3.6	80	20	00
[3] Turkey, edible portion, average	Two small servings	33	1.2	29	71	00
VEGETABLES.						
[3] Artichokes, as purchased, average, canned		430	15.	14	0	86
[3] Asparagus, as purchased, average, canned		540	19.	33	5	62
[3] Asparagus, as purchased, average, cooked		206	7.19	18	63	19
[3] Beans, baked, canned	Small side dish	75	2.66	21	18	61
[3] Beans, Lima, canned	Large side dish	126	4.44	21	4	75
[3] Beans, string, cooked	Five servings	480	16.66	15	48	37
[3] Beets, edible portion, cooked	Three servings	245	8.7	2	23	75
[3] Cabbage, edible portion		310	11.	20	8	72
[3] Carrots, edible portion, average, fresh		215	7.6	10	8	82
Carrots, cooked	Two servings	164	5.81	10	34	56
[3] Cauliflower, as purchased, average		312	11.	23	15	62
[3] Celery, edible portion, average		540	19.	24	5	71
Corn, sweet, cooked	One side dish	99	3.5	13	10	77
[3] Cucumbers, edible portion, average		565	20.	18	10	72
[3] Egg plant, edible portion, average		350	12.	17	10	73
Lentils, cooked		89	3.15	27	1	72
[3] Lettuce, edible portion, average		505	18.	25	14	61
[3] Mushrooms, as purchased, average		215	7.6	31	8	61
[3] Onions, fresh, edible portion, average		200	7.1	13	5	82
[3] Onions, cooked	Two large servings	240	8.4	12	40	48
[3] Parsnips, edible portion, average	1½ serving	152	5.3	10	7	83
Parsnips, cooked		163	5.84	10	34	56
[3] Peas, green, canned	Two servings	178	6.3	25	3	72
[3] Peas, green, cooked	One serving	85	3.	23	27	50
Potatoes, baked	One good sized	86	3.05	11	1	88
[3] Potatoes, boiled	One large sized	102	3.62	11	1	88
[3] Potatoes, mashed (creamed)	One serving	89	3.14	10	25	65
Potatoes, steamed	One serving	101	3.57	11	1	88
[3] Potatoes, chips	One-half serving	17	.6	4	63	33
[3] Potatoes, sweet, cooked	Half of average potato	49	1.7	6	9	85
[3] Pumpkins, edible portion, average		380	13.	15	4	81
Radishes, as purchased		480	17.	18	3	79

Name of food.	"Portion" containing 100 calories roughly described.	Weight of 100 calories.		Percentage of—		
		Grams.	Ounces.	Protein.	Fat.	Carbohydrate.
Vegetables—*Continued.*						
Rhubarb, edible portion, average		430	15.	10	27	63
[3] Spinach, cooked, as purchased	Two ordinary servings	174	6.1	15	66	19
[3] Squash, edible portion, average		210	7.4	12	10	78
[3] Succotash, canned, as purchased, average	Ordinary serving	100	3.5	15	9	76
[3] Tomatoes, fresh, as purchased, average	Four average tomatoes	430	15.	15	16	69
Tomatoes, canned		431	15.2	21	7	72
[3] Turnips, edible portion, average	Two large servings	246	8.7	13	4	83
Vegetable oysters		273	9.62	10	51	39
Dairy Products.						
[3] Butter, as purchased	Ordinary pat or ball	12.5	.44	.5	99.5	00
[3] Buttermilk, as purchased	1½ glasses	275	9.7	34	12	54
[3] Cheese, American, pale, as purchased	1½ cubic inches	22	.77	25	73	2
[3] Cheese, cottage, as purchased	4 cubic inches	89	3.12	76	8	16
[3] Cheese, full cream, as purchased	1½ cubic inches	23	.82	25	73	2
[3] Cheese, Neufchatel, as purchased	1½ cubic inches	29.5	1.05	22	76	2
[3] Cheese, Swiss, as purchased	1½ cubic inches	23	.8	25	74	1
[3] Cheese, pineapple, as purchased	1½ cubic inches	20	.72	25	73	2
[3] Cream	¼ ordinary glass	49	1.7	5	86	9
Kumiss		188	6.7	21	37	42
[3] Milk, condensed, sweetened, as purchased		30	1.06	10	23	67
[3] Milk, condensed, unsweetened (evaporated cream), as purchased		59	2.05	24	50	26
[3] Milk, skimmed, as purchased	1½ glasses	255	9.4	37	7	56
[3] Milk, whole, as purchased	Small glass	140	4.9	19	52	29
[3] Whey, as purchased	Two glasses	360	13.	15	10	75
Fruits (Dried).						
[3] Apples, as purchased, average		34	1.2	3	7	90
Apricots, as purchased, average		35	1.24	7	3	90
[3] Dates, edible portion, average	Three large	28	.99	2	7	91
[3] Dates, as purchased		31	1.1	2	7	91
[3] Figs, edible portion, average	One large	31	1.1	5	0	95
[3] Prunes, edible portion, average	Three large	32	1.14	3	0	97
[3] Prunes, as purchased		38	1.35	3	0	97
[3] Raisins, edible portion, average		28	1.	3	9	88
[3] Raisins, as purchased		31	1.1	3	9	88

FRUITS (FRESH OR COOKED).						
[3] Apples, as purchased	Two apples	206	7.3	3	7	90
Apples, baked		94	3.3	2	5	93
Apples, sauce	Ordinary serving	111	3.9	2	5	93
[3] Apricots, edible portion, average		168	5.92	8	0	92
Apricots, cooked	Large serving	131	4.61	6	0	94
[3] Bananas, yellow, edible portion, average	One large	100	3.5	5	5	90
[3] Blackberries, as purchased, average		170	5.9	9	16	75
Blueberries		128	4.6	3	8	89
[3] Blueberries, canned, as purchased		165	5.8	4	9	87
Cantaloupe	Half ordinary serving	243	8.6	6	0	94
[3] Cherries, edible portion, average		124	4.4	5	10	85
[3] Cranberries, as purchased, average		210	7.5	3	12	85
[3] Grapes, as purchased, average		136	4.8	5	15	80
Grape fruit		215	7.57	7	4	89
Grape juice	Small glass	120	4.2	0	0	100
Gooseberries		261	9.2	5	0	95
[3] Lemons		215	7.57	9	14	77
Lemon juice		246	8.77	0	0	100
Nectarines		147	5.18	4	0	96
Olives, ripe	About seven olives	37	1.31	2	91	7
[3] Oranges, as purchased, average	One very large	270	9.4	6	3	91
Oranges, juice	Large glass	188	6.62	0	0	100
[3] Peaches, as purchased, average	Three ordinary	290	10.	7	2	91
Peaches, sauce	Ordinary serving	136	4.78	4	2	94
Peaches, juice	Ordinary glass	136	4.80	0	0	100
[3] Pears	One large pear	173	5.40	4	7	89
Pears, sauce		113	3.98	3	4	93
[3] Pineapples, edible portion, average		226	8.	4	6	90
Raspberries, black		146	5.18	10	14	76
Raspberries, red		178	6.29	8	0	92
[3] Strawberries, as purchased, average	Two servings	260	9.1	10	15	75
[3] Watermelon, as purchased, average		760	27.	6	6	88
CAKES, PASTRY, PUDDING, AND DESSERTS.						
[3] Cake, chocolate layer, as purchased	Half ordinary square piece	28	.98	7	22	71
[3] Cake, gingerbread, as purchased	Half ordinary square piece	27	.96	6	23	71
[3] Cake, sponge, as purchased	Small piece	25	.89	7	25	68
Custard, caramel		71	2.51	19	10	71
Custard, milk	Ordinary cup	122	4.29	26	56	18
Custard, tapioca	Two-thirds ordinary	69.5	2.45	9	12	79
[3] Doughnuts, as purchased	Half a doughnut	23	.8	6	45	49
[3] Lady fingers, as purchased		27	.95	10	12	78
[3] Macaroons, as purchased		23	.82	6	33	61
[3] Pie, apple, as purchased	One-third ordinary piece	38	1.3	5	32	63

Name of food.	"Portion" containing 100 calories roughly described.	Weight of 100 calories.		Percentage of—		
		Grams.	Ounces.	Protein.	Fat.	Carbohydrate.
CAKES, PASTRY, PUDDING, AND DESSERTS—*Continued.*						
[3] Pie, cream, as purchased	One-fourth ordinary piece	30	1.1	5	32	63
[3] Pie, custard, as purchased	One-third " "	55	1.9	9	32	59
[3] Pie, lemon, as purchased	One-third " "	38	1.35	6	36	58
[3] Pie, mince, as purchased	One-fourth " "	35	1.2	8	38	54
[3] Pie, squash, as purchased	One-third " "	55	1.9	10	42	48
Pudding, apple sago	....	81	3.02	6	3	91
Pudding, brown betty	Half ordinary serving	56.6	2.	7	12	81
Pudding, cream rice	Very small serving	75	2.65	8	13	79
Pudding, Indian meal	Half ordinary serving	56.6	2.	12	25	63
Pudding, apple tapioca	Small serving	79	2.8	1	1	98
Tapioca, cooked	Ordinary serving	108	3.85	1	1	98
SWEETS AND PICKLES.						
[3] Catsup, tomato, as purchased, average	....	170	6.	10	3	87
[3] Honey, as purchased	Four teaspoonfuls	30	1.05	1	0	99
[3] Marmalade (orange peel)	....	28.3	1.	.5	2.5	97
[3] Molasses, cane	....	35	1.2	.5	0	99.5
[3] Olives, green, edible portion	Seven olives	32	1.1	1	84	15
[3] Olives, ripe, edible portion	Seven olives	38	1.3	2	91	7
[3] Pickles, mixed, as purchased	....	415	14.6	18	15	67
[3] Sugar, granulated	Three teaspoonfuls or 1½ lumps	24	.86	0	0	100
[3] Sugar, maple	Four teaspoonfuls	29	1.03	0	0	100
[3] Syrup, maple	Four teaspoonfuls	35	1.2	0	0	100
NUTS.						
[3] Almonds, edible portion, average	About eight	15	.53	13	77	10
[3] Beechnuts	....	14.8	.52	13	79	8
[3] Brazil nuts, edible portion	Three ordinary size	14	.49	10	86	4
[3] Butternuts	....	14	.50	16	82	2
[3] Cocoanuts	....	16	.57	4	77	19
[3] Chestnuts, fresh, edible portion, average	....	40	1.4	10	20	70
[3] Filberts, edible portion, average	Ten nuts	14	.48	9	84	7
[3] Hickory nuts	....	13	.47	9	85	6
[3] Peanuts, edible portion, average	Thirteen double	18	.62	20	63	17
[3] Pecans, polished, edible portion	About eight	13	.46	6	87	7
[3] Pine nuts (pignolias), edible portion	About eighty	16	.56	22	74	4
[3] Walnuts, California, edible portion	About six	14	.48	10	83	7

Cereals.						
[3] Bread, brown, as purchased, average	Ordinary thick slice	43	1.5	9	7	84
[3] Bread, corn (johnnycake), as purchased, average	Small square	38	1.3	12	16	72
Bread, white, home made, as purchased	Ordinary thick slice	38	1.3	13	6	81
[3] Corn flakes, toasted	Ordinary cereal dish	27	.97	11	1	88
[3] Corn meal, granular, average		27	.96	10	5	85
[3] Corn meal, unbolted, edible portion, average		26	.92	9	11	80
[3] Crackers, graham, as purchased	Two crackers	23	.82	9	20	71
[3] Crackers, oatmeal, as purchased	Two crackers	23	.81	11	24	65
[3] Hominy, cooked	Large serving	120	4.2	11	2	87
[3] Macaroni, average		27	.96	15	2	83
[3] Macaroni, average, cooked	Ordinary serving	110	3.85	14	15	71
[3] Oatmeal, average, boiled	1½ serving	159	5.6	18	7	75
[3] Popcorn, average		24	.86	11	11	78
[3] Rice, uncooked		28	.98	9	1	90
[3] Rice, boiled, average	Ordinary cereal dish	87	3.1	10	1	89
[3] Rice, flakes	Ordinary cereal dish	27	.94	8	1	91
[3] Rolls, Vienna, as purchased, average	One large roll	35	1.2	12	7	81
[3] Shredded wheat	One biscuit	27	.94	13	4.5	82.5
[3] Spaghetti, average		28	.97	12	1	87
[3] Wheat flour, entire wheat, average		27	.96	15	5	80
[3] Wheat flour, graham, average		27	.96	15	5	80
[3] Wheat flour, patent roller process, family and straight grade spring wheat, average		27	.97	12	3	85
[3] Zwieback	Size of thick slice of bread	23	.81	9	21	70
Miscellaneous.						
[3] Eggs, hens', boiled	One large egg	59	2.1	32	68	00
[3] Eggs, hens', whites		181	6.4	100	0	00
[3] Eggs, hens', yolks	Two yolks	27	.94	17	83	00
[3] Omelet		94	3.3	34	60	6
[3] Soup, beef, as purchased, average		380	13.	69	14	17
[3] Soup, bean, as purchased, average	Very large plate	150	5.4	20	20	60
[3] Soup, cream of celery, as purchased, average	Two plates	180	6.3	16	47	37
[3] Consomme, as purchased		830	29.	85	00	15
[3] Clam chowder, as purchased	Two plates	230	8.25	17	18	65

[1] Experiments on Losses in Cooking Meats (1900–1903), Grindley, U. S. Department of Agriculture, Bulletin No. 141.
[2] Laboratory number of specimen, as per Experiments on Losses in Cooking Meats.
[3] Chemical Composition of American Food Materials, Atwater and Bryant, U. S. Department of Agriculture, Bulletin No. 28.

Protein and Cereal Portions.—Arnold has suggested the use of standard portions based on arbitrary standards. The "protein portion" being equal to the protein in one egg, 8 grams; the cereal portion being the amount of cereal that will contain 4 grams of pro-

tein. This method may be used to advantage where the protein content of the food is the chief concern. Tables showing the value of 100 grams of various foods will be found of use in this connection:

Protein Portion.

P.	F.	C.	Cal.	
8	5	5	100	Average portion.
8	5.5	..	80	Egg, 1.
8	8	8	140	Milk, 1 glass (200 c.c.).
7.5	1.25	1.25	100	Buttermilk, ½ pt.
8	5	..	80	Meat or fish, 1⅓ ozs., or one-third serving.

Cereal Portion.

P.	F.	C.	Cal.	Cooked foods.
4	1	30	140	Average portion.
4	2	24	135	Cereal, 4 tablespoons.
4	..	60	240	Rice, 4 tablespoons.
4	2	20	120	Macaroni, 4 tablespoons.
2	2	20	120	Vermicelli, 4 tablespoons.
4	..	40	180	Potatoes, 2 moderate sized.
3	0.5	15	80	Bread, 1 oz. (or slice).
3	3	20	120	Crackers, 1 oz.
3	0.5	22	100	Shredded wheat, 1 biscuit.

An Ideal Ration of Liquid Food.—(Mrs. E. H. Richards.)

Material.	Amount.	Proteid.	Fat.	Carbo-hydrates.	Calories.
		Gm.	*Gm.*	*Gm.*	
Beef broth or consommé	1 pint . .	20.5	0.5		
To which has been added one large egg minus shell	2 ounces .	4.1	6.8	. .	91.67
Dried fruit soup	1 quart. .	. .	. .	100.0	410.00
Lemon jelly	½ pint . .	6.5	. .	12.5	77.90
Whole milk	1 quart. .	34.0	36.0	44.0	651.00
Rice or arrowroot . . .	3 oz. (dry)	6.3	0.3	67.2	304.11
Grape-sugar or some one of the prepared foods (dry)	4 oz. (dry)	2.5	. .	100.0	420.25
Total	2.5–3 qt.[1] .	76.9	43.6	323.7	2043.63

While diet-lists are easily prepared according to the method just outlined, it must always be remembered that the digestibility and absorbability of food play a most important rôle, and are not to be neglected in formulating the dietary; for while a certain food may contain a great many more calories than an equal weight of another food, yet its relative indigestibility and non-absorbability may render it far less available as an article of diet. For example, while 4 ounces of sausage produce 510 calories, 4 ounces of cheese 520, and 4 ounces of beef only 280, yet the beef is far more digestible than either the sausage or cheese, and thus more valuable as an article of food. As has been aptly said, "We live not upon what we eat, but upon what we digest." Therefore, a diet-list giving quantities of food principles or calories is useful only as it suggests general principles that may

[1] According to how the rice is given.

be modified to meet individual conditions in health and in disease.

The following table of Roberts[1] will be found of value in computing diet:

Values of Common Foods in Household Measures.

Foods as eaten.	Actual amount.	Household measure.	Calories.	Grams proteid.	Remarks.
Milk	8 oz.	glassful	160	8.4	
Buttermilk and skimmed milk	8 oz.	glassful	80	8.0	
Cream	5 gm.	teaspoonful	10	0.2	
Condensed milk, sweetened	20 gm.	heaping teaspoonful	50	1.8	
Condensed milk, unsweetened	20 gm.	heaping teaspoonful	30	1.8	
Cocoa powders	10 gm.	heaping teaspoonful	40	2.0	
Chocolate powders	10 gm.	heaping teaspoonful	90	1.2	Greater nutritive value depends on larger amount of fat.
Beef juices, beef tea, bouillon, clear soup	5 oz.	teacupful	5–30	1–3	
Proprietary beef fluids	5 gm.	teaspoonful	1–10		
Beef and egg powders	10 gm.	heaping teaspoonful	30	8	
Thick or cream soup	8 oz.	soup-plateful	100–250	. . . . .	Nutritive value increases as the thickness is made greater by proteid or carbohydrate addition to milk.
Alcohol	1 gm.	. . . .	7		
Whisky, brandy, etc.	1 oz.	. . . .	85		
Wines	1 oz.		15–40		
Sugar	10 gm.	heaping teaspoonful	40		
Eggs, whole	50 gm.	one	70		
Eggs, yolk	. . . . . .	one	55	2.4	
Butter	10 gm.	one-inch cube	65	0.6	
Cheese	10 gm.	one-inch cube	45	3.0	
Meat and fish, lean	50 gm.	heaping tablespoonful	60	12.0	¼ lb. of lean steak will thus give 185 calories; an ordinarily generous portion of rib-roast with moderate fat, about 225 calories.
Meat, medium fat	50 gm.	heaping tablespoonful	100	7.0	
Meat, very fat	50 gm.	heaping tablespoonful	150	4.0	
Oysters, small	8 gm.	one	3	.5	
Oysters, very large	25 gm.	one	10	1.5	
Bread, slice, 4x4x½ in. thick	25 gm.	one slice	50	1.5	
Crackers	3–10 gm.	one	12–30	.3–.6	
Cereals, in cooked state	30–40 gm.	teacupful	110–150	3–5	A cupful equals a saucerful; a bowlful equals 2 cupfuls.
Cereals, eaten as purchased	5–7 gm.	heaping teaspoonful	18–25	.5–.7	
Shredded wheat	30 gm.	one	100	3.0	
Triscuit	15 gm.	one	50	1.5	
Peas, fresh or canned	35 gm.	heaping tablespoonful	25	2.0	The apparent low value due to large amount of water.
Peas, dried	25 gm.	heaping tablespoonful	100	6.0	A tablespoonful of dried peas to a plateful of soup.
Beans, dried	25 gm.	heaping tablespoonful	90	5.0	
Beans, fresh or canned	30 gm.	heaping tablespoonful	30	1.0	
Potatoes—medium size	90 gm.	one (3 inches long)	80	1.0	
Jelly, sweetened	. . . . . .	teacupful	50–120	. . . . .	Value depends on amount of sugar and gelatin used.
Apples	100 gm.	one	40	.2	
Oranges	125 gm.	one medium size	60	.5	
Bananas	50 gm.	one medium size	45	.7	
Dried fruit, prunes, etc.	100 gm.	medium size saucerful	100–200	1–2	Value depends largely on the sugar used as preservative.

[1] Jour. of the Amer. Med. Assoc., April 21, 1906.

Other valuable tables will be found in the various sections relating to diseases, especially in the one on diabetes.

The following instructive table is taken from Sutherland's System of Diet and Dietetics:

The Calorie Value of Common Foods per Ounce.

(Meat, fish, and cereals are cooked. Vegetables are boiled.)

0–5.	5–10.	10–20.	20–30.	30–40.	40–50.	50–60.	60–70.	70–80.	80–90.	90–100.	100–125.	Over 125.
Vegetable marrow. Spinach. Seakale. Onion. Turnip. Savoy cabbage. Cauliflower. Parsnip. Beetroot. Carrot. Scarlet runner (uncooked). Celery. Cucumber. Lettuce. Tomato. Radish. Buttermilk.	Asparagus. Broccoli. Artichoke. Broad beans. Green peas. Brussel sprouts. Watermelon. Whey.	Leeks. Salsify. Green artichoke. Petit pois. Haricot beans. Beetroot (uncooked). Strawberry. Pineapple. Lemon. Cranberry. Orange. Raspberry. Blackberry. Apricot. Apple. Pear. Nectarine. Benger's food (cooked). Most farinaceous foods. Koumiss. Egg, white. Hake.	Potatoes. Cherries. Prunes. Figs. Grapes. Bananas. Crab (tinned). Lobster (tinned). Smelts. Dory. Sole. Whiting. Plaice. Turbot. Cod. Lemon sole. Tea. Jam. Milk.	Baked beans. Lentils. Macaroni. Scotch oatmeal. Haddock. Gurnet. Trout. Roach. Red mullet. Halibut. Jam.	Dried peas. Whole egg. Mackerel. Brill. Lobster (potted). Crab (potted).	Sprats. Salmon. Herring. Tunny. Chicken (fricasseed). Coffee.	Breads: Daren. Manhu. Cytos. Hovis. Brown. Salt herring. Eels. Roast lamb. Roast beef. Veal cutlets. Roast veal.	Arrowroot. Breads: White. Bermaline. Graham. Pork sausage. German sausage. Toffee.	Sardines. Roast turkey. Mutton (legs, roast or boiled). Ham. Cheese: Dutch. Camembert. Chestnuts. Treacle.	Roast pork. Brie cheese. Parmesan cheese. Currants (dried). Figs (dried). Filberts. Maple sugar.	Egg yolk. Polony. Roast mutton. Uncooked cereals. Milk. Cream cheese. Gorgonzola cheese. Cheddar cheese. Gruyére cheese. Cheshire cheese. Gloucester cheese. American cheese. Roquefort cheese. Raisins. Dates. Walnuts. Cocoanut. Cane-sugar. Beet-sugar. Honey.	Bacon (ribs). Stilton cheese. Neufchatel cheese. Peanuts. Sweet almonds. Cocoas. Chocolate. Butter.

CLASSES OF FOODS

ANIMAL FOODS

Animal foods contain much digestible matter, chiefly proteins, a considerable quantity of fat, in some foods carbohydrates, and, in addition, water and mineral salts. Being thoroughly digested, they leave but little residue in the intestine. The various forms of animal foods—milk, eggs, meat, fish, and gelatin—will now be described under these headings.

MILK AND MILK PRODUCTS

Milk, the most important of animal foods, contains all the elements necessary for the maintenance of life, and constitutes a complete food.

Composition.—Milk contains varying proportions of each of the four classes of food principles, protein, fats, carbohydrates, and mineral salts, and from 84 to 90 per cent. of water; this latter varying with the quality of the milk. In a general way this is true of all milks, which are more or less alike, but which contain different percentages of the constituents.

Milk forms the exclusive diet for the young, growing mammals, but owing to the fact that the proportions of proteins and fat are in excess of the carbohydrates, it is unsuited as an exclusive diet for adults. Unless otherwise stated cows' milk is meant by milk in this volume. Cows' milk is most extensively used for food, but the milk of goats and asses and some other animals is used to some extent.

Fresh cows' milk has a sweetish taste, a characteristic odor, and is yellowish-white in color; on standing it separates into two distinct layers, the upper being more yellow in color, of lighter specific gravity, and containing more fat. For dietetic purposes it is well to think of cream as a milk containing varying percentages of fat. The lower part, called ''skim milk'' after the removal of the cream, is of a bluish-white color, and may be considered relatively free from fat. The specific gravity of milk varies from 1.027 to 1.035 and it freezes at a slightly lower temperature than water.

There are numerous statements and theories concerning the reaction of cows' and human milk. Freshly drawn, the milk of most carnivora is acid to the litmus reaction; human milk is alkaline, sometimes acid or amphoteric, and cows' milk amphoteric—turning red litmus blue and vice versa. On exposure to the air all milks will turn blue litmus red, owing to the conversion of the milk-sugar into lactic and other acids.

(VAN SLYKE.)

Milk, 100.0	Water, 87.1			
	Solids, 12.9	Fat, 3.9		
		Solids not fat, 9.0	Nitrogen compounds, 3.2	Casein, 2.5
				Albumen, etc., 0.7
				3.2
			Milk-sugar, 5.1	
			Ash (salts), 0.7	
			9.0	
		12.9		
	100.0			
	Gases: Carbon dioxide, Nitrogen. Oxygen.			

(BABCOCK.)

Milk, 100.0	Butter fat, 3.6	Olein, Palmitin, Stearin, Myristin, Butin (trace)		Glycerides of insoluble and non-volatile acids	3.3	Fat	3.6	Total solids, 12.7
		Butyrin, Caproin, Caprylin (trace), Caprinin (trace)		Glycerides of soluble and volatile acids	0.3			
					3.6			
	Milk serum, 96.4	Casein	3.00	Containing nitrogen	3.8	Solids not fat	9.1	
		Albumin	0.60					
		Lactoglobulin, Galactin, Fibrin (trace)	0.20					
			3.80					
		Milk-sugar			4.5			
		Citric acid			0.1			
		Potassium oxide	0.175	Ash	0.7			
		Sodium oxide	0.070					
		Calcium oxide	0.140					
		Magnesium oxide	0.017					
		Iron oxide	0.001					
		Sulphur trioxide	0.027					
		Phosphoric pentoxide	0.170					
		Chlorine	0.100					
			0.7		9.1		12.7	
		Water						87.3
	100.0							100.0

The microscopic examination with a low power shows the fat globules and some leukocytes and foreign matter if present; with the immersion lens the bacterial contents may be studied.

Kastle and Roberts give the scheme on p. 96, compiled by Van Slyke and Babcock.

The principal nitrogenous compound of milk is casein, which differs from the other protein compounds in that it contains both phosphorus and sulphur. Casein is not coagulated by heat, but this change may be effected by adding acid or rennet. The casein clot formed by adding acids may be dissolved by neutralizing the acid, while that formed by rennet is not affected by the addition of an alkali.

Milk also contains other proteins, as lactalbumin, which is similar to the serum-albumin of the blood, lactoglobulin, and lactomucin. The total proteins average about 3.3 per cent. of the bulk of the milk, or about 25 per cent. of the total solids.

The fats of milk consist of the glycerids of palmitic, stearic, and oleic acids. In addition to these, milk contains several other fats in smaller proportions, to which the flavor of butter is in part due. The fat is suspended in the milk in the form of minute globules, which give the milk its white color and opacity. The fat globules in some milks are larger than in others. They are smallest from a herd of mixed common cows and largest in the milk of Jerseys and Guernseys. Fat averages about 4 per cent. of the milk, or about 31 per cent. of the total solids.

The chief carbohydrate of milk is lactose, or milk-sugar, which is not nearly so sweet as ordinary sugar, and is less soluble in water. It reacts to Fehling's solution like glucose, and in the presence of the lactic acid bacillus it is converted into lactic acid, which causes the milk to turn sour. Lactose forms about 38 per cent. of the total solids.

Milk contains about 0.7 per cent. of salts, which exist chiefly in the form of phosphates, chlorids, and sulphates. Potassium salts occur in larger quantities than do sodium salts.

Calcium salts are very essential to young, growing animals, inasmuch as they play a very important part in the formation of bone. The relative percentages of salts in the ash of human milk are shown by the following table:

Calcium phosphate	23.87
" sulphate	2.25
" carbonate	2.85
" silicate	1.27
Potassium carbonate	23.47
" chlorid	12.05
" sulphate	8.33
Magnesium carbonate	3.77
Sodium chlorid	21.77
Ferric oxid and aluminum	0.37
	100.00

When the cow is diseased, various substances not present in normal milk may be discovered, as urobilin and bile. Milk may also contain

odoriferous substances from things which the cow has eaten, as wild garlic. Milk also absorbs odors from the air.

Variations in Milk.—There are wide variations in the composition of the milk of different animals. While human milk contains more sugar and less protein than cows' milk, the fuel-value is about the same. Dogs' milk seems to be the richest, whereas that which comes from the horse is exceedingly poor, as may be seen from the following table:

Comparative Composition of Various Kinds of Milk.[1]

Kind of milk.	Water.	Total solids.	Total solids. Protein. Casein.	Albumin.	Total protein.	Fat.	Carbohydrates (milk-sugar).	Mineral matters (ash).	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Woman	87.4	12.6	1.0	1.3	2.3	3.8	6.2	0.3	319
Cow . .	87.2	12.8	3.0	0.5	3.5	3.7	4.9	0.7	313
Dog . .	75.4	24.6	6.1	5.1	11.2	9.6	3.1	0.7	671
Ewe .	80.8	19.2	5.0	1.5	6.5	6.9	4.9	0.9	503
Buffalo.	81.4	18.6	5.8	0.3	6.1	7.5	4.1	0.9	506
Cat . . .	82.1	17.9	3.1	6.0	9.1	3.3	4.9	0.6	400
Goat . .	85.7	14.3	3.2	1.1	4.3	4.8	4.4	0.8	365
Llama .	86.5	13.5	3.0	0.9	3.9	3.2	5.6	0.8	312
Ass . . .	89.6	10.4	0.7	1.6	2.3	1.6	6.0	0.5	222
Mare . .	91.5	8.5	1.2	0.1	1.3	1.2	5.7	0.3	180

Not only is there a wide variation in the milk of different animals, but cows' milk itself is subject to great changes in the percentage composition of its ingredients. These may be attributed to many causes, the breed and condition of animals and the food and the care they receive being responsible in a great degree for these changes. As a rule, a young cow gives better milk than an old one, and a well-fed animal yields richer milk than one that is poorly fed. The milk-flow is greatest shortly after calving, but the milk increases in richness as the quantity becomes smaller.

Milk Ferments.—Milk contains numerous ferments, to which considerable attention has been devoted of late years. Marfan believes that these ferments probably make up for the deficiencies of the glandular secretions in the newborn, and that there may be specific ferments, which explains the desirability of milk of a particular species as food for animals belonging to it. The principal ferments are proteolytic ferments, resembling trypsin, but less sensitive to acids; fat-splitting ferments, lipase, amylase, peroxidase, and catalase.

The Action of Heat.—The amount of change taking place in milk on heating depends upon the degree of heat and the length of exposure. Heating up to 60° C. does not appreciably change the appearance or taste, although some changes which defy detection evidently occur. When the milk reaches a little over 60° C. a scum, composed largely of fatty matter and casein, forms on the surface.

[1] König, Chemie der menschlichen Nährungs- und Genussmittel, 3 ed., vol. i., pp. 267-362.

Acid milks are coagulated much more easily and more quickly than milk which is not acid, and even when pasteurized at a low temperature such milks may clot. In order to prevent this, milk should be pasteurized as soon after milking as possible. Boiling milk changes its taste and color, the cream will not rise as quickly, if at all, and it is less easily coagulated by the action of rennet and less easily pancreatized. The change in color is due to the production of a certain amount of caramel from the milk-sugar; lecithin and nuclein are decomposed, lessening the amount of organic phosphorus present and increasing the inorganic phosphorus; the calcium and magnesium salts and part of the phosphates are precipitated; the carbon dioxid is driven off, some of the fat globules coalesce, and the serum-albumin is coagulated; the ferments of the milk are also destroyed. Although these enzymes will withstand a temperature of 60° C. for an hour without much injury, most of them are totally destroyed by a temperature of 65° C., and the most resistant by a temperature of 76° C.

Frozen Milk.—Freezing milk is sometimes resorted to as a means of keeping it during transportation. It should be kept frozen until used. While this method is employed in some places, it has never come into anything like general use. Frozen milk should be boiled as soon as thawed if it is necessary to use it in infant feeding.

Cold storage of milk is frequently resorted to, but when the milk is kept at a temperature of about 0° C. there is very considerable growth of bacteria, especially of certain varieties that flourish at low temperatures. A very complete study of this subject has been made by Pennington,[1] to which the reader is referred for details. In such milk the bacteria increase in number for five or six weeks, and after that certain species die out, while the most resistant apparently are present even for years. The acidity is very much increased, although curd rarely separates. The protein of the milk is digested, and in some cases as much as 50 per cent. is changed into soluble compound.

Pregnancy in the Cow and the Use of Milk.—Up to ten days before calving the milk is generally safe for use, but if very visibly altered it should not be used and the cow may go dry before that time. After calving the milk is normal after ten days time; before that the composition may be altered by the presence of colostrum. The rule of the Walker-Gordon Company is to exclude the milk for three weeks before the expected calving and for ten days afterwards.

Sterilization and Pasteurization.—Heat is employed very frequently in keeping milk, and there are two methods in vogue, spoken of as sterilization and pasteurization.

Sterilization of milk is accomplished either by boiling, preferably in the vessel in which it is to be kept, or by placing the bottles in one of the numerous forms of sterilizers that are on the market. The essential part of the process is that the milk be heated to 212° F. and maintained at that temperature for ten minutes or longer, or

[1] Journal of Biological Chemistry, 198, p. 353.

sufficient to kill all the living bacteria which the milk contains. It is to be noted, however, that the spores of spore-bearing bacteria are not killed by this temperature, and that if the milk is kept under suitable conditions for bacterial growth, bacteria will develop from the spores, and the milk may spoil in consequence. In order to secure perfectly sterile milk it is, therefore, necessary to repeat the sterilization three times on three successive days. In practical work this is rarely done, except in the production of culture-media for bacterial researches or in preparing milk for long voyages. Ordinarily, milk heated once and then kept cold, 40° F. or under, will keep perfectly well the length of time required in its ordinary consumption. There are certain objections to sterilized milk. Certain changes are produced in the milk which are detailed under the heading of the "Effects of Heat." Sterilizing also kills off the ferments and places the milk in the class of lifeless foods. Sterilizing on a large scale has never become popular in America, perhaps on account of the change in taste and the added expense. It may be used with advantage, however, in keeping milk in very hot weather, especially when the ice supply is deficient.

By pasteurization is meant the process by which the milk is rendered more or less sterile by heating to 167° F., and in some instances to a lower temperature, maintaining this degree of heat for from twenty to forty-five minutes, and then cooling the milk rapidly to 40°, or 45° F. or lower. This degree of temperature is sufficient to kill off most of the bacteria and especially the pathogenic bacteria, but it does not render the milk absolutely sterile, so that it does not keep as well as that which has been heated to a higher temperature. It has the advantage, however, of not changing materially the composition of the milk. Pasteurized milk should be kept cold or it will spoil nearly as rapidly as unheated milk. It is useful in summer and in keeping milk which is to be fed to babies, and is being used at the present time very extensively for keeping commercial milk. In the household, for the purpose of infant feeding, pasteurization is done in two ways. Best, by using one of the special forms of pasteurizers, such as Freeman's, which consists of two parts, a pail for the water and receptacle for the bottles of milk. The pail is a simple pail with a cover; there is a groove extending around the pail to indicate the level to which it is to be filled with water, and supports inside for the receptacle for the bottles of milk to rest on. The receptacle for the bottles of milk consists of a series of hollow zinc cylinders fastened together; this fits into the pail, so that the lower inch of the cylinders is immersed in the water. This receptacle has two sets of horizontal supports, the upper set continuous around the receptacle, for use while the milk is being heated; the lower interrupted set is used for raising the receptacle during cooling. Such receptacles are made

for ten 6-ounce bottles, seven 8-ounce bottles, three 1-pint and one ½-pint bottles, and two 1-quart bottles. There is also a large apparatus for the use of hospitals or public institutions, which has a receptacle for forty-three 6-ounce or 8-ounce bottles.

The apparatus is used in the following way: The pail is filled to the level of the groove with water, covered and put on the stove, the receptacle for the bottles being left out. The bottles of milk are then filled, stoppered with cotton, and dropped into their places in the cylinders. Sufficient water is poured into each cylinder to surround the body of the bottle. As soon as the water in the pail boils thoroughly, it is taken from the stove and set on a mat or table or other non-conductor in a place where there is not a draft of wind blowing on it. The lid of the pail is removed and the receptacle rests on the lower supports. The lid is then rapidly put on the pail, and the pail is thus allowed to stand for three-quarters of an hour. During the first fifteen minutes the temperature of the milk rises to about its maximum, or above 65° C., the point desired for pasteurizing, and remains there the remaining thirty minutes. During the last fifteen minutes the cover of the pail is removed, the receptacle is lifted and given a turn so as to rest on the upper supports, thus bringing the top of the cylinders containing the bottles above the level of the pail. The pail is then put under a cold-water faucet and the water is allowed to run into the pail and overflow, but it should not run into the cylinders. Thus the hot water is replaced by cold water, and in fifteen minutes the milk in the bottles is of about the temperature of the cold water used. The bottles may then be put into a refrigerator until required for feeding. This rapid cooling is a most necessary part of a low-temperature sterilization, the importance of which is apt to be overlooked.

When there is no special apparatus at hand, reasonably good results may be obtained by placing the milk bottles in a pail, filling the pail to the height of the milk in the bottles and bringing nearly to a boil, then setting to one side for thirty minutes. In commercial pasteurization, special forms of apparatus are used, in which large quantities of milk may be heated the required temperature for twenty minutes.

The advantages of pasteurization are that it is a cheap and effective method of preventing the ordinary infectious diseases which may at times be spread by milk, and doubtless lessens the number of cases of infantile diarrhea. It should be remembered that pasteurization cannot make bad milk good or dirty milk clean, and when used for infants or invalids it must be modified in the same manner as unheated milk.

The disadvantages of pasteurized milk are, that it is usually done a long way from the place of production, the milk may be spoiled before it is pasteurized, and while the bacteria are for the most part

killed, the toxins which may have been formed are not destroyed, and so dangerous milk may be sold for good milk. This is, however, counterbalanced by the real lessening of infantile diarrhea. Another disadvantage is that the milk producer is apt to become careless and trust to pasteurization to kill off the bacteria instead of using cold and cleanliness. Pasteurized milk is popularly supposed to be less digestible than unheated milk, especially for infants. The difference in digestibility of pasteurized and unheated milk is certainly slight, but the best results in infant feeding are obtained by the use of unheated milk. We are of the decided opinion that unheated milk is far superior in the long run, where it can be obtained of sufficient purity to permit of its use. There are other objections sometimes urged against heated milk, such as it favors the development of scurvy. This is evidently true, but is a lesser evil than diarrhea.

Sterilizing milk under pressure is rarely resorted to outside of laboratories. A temperature of 220° F. for thirty minutes is ordinarily considered to produce sterile milk, but sometimes even this is insufficient.

The loss in viscosity in sterilized and pasteurized cream, rendering it thinner and difficult to whip, may be counteracted by a material called viscogen, suggested by Babcock and Russel. It consists of a mixture of half an ounce of cane-sugar in a quart of lime-water. It is allowed to settle and the clear fluid used in the proportion of about two-thirds the amount needed to neutralize the cream. This may be easily determined by titration.

Digestion of Milk.—When milk enters the stomach it is coagulated by the hydrochloric acid and the rennin of the gastric juice. These curds, or coagula, consist of precipitated casein and a proportion of the fat that has become entangled in the curd. They vary in size and consistence according to the amount and the dilution of the milk taken. The casein soon undergoes change, being converted into some form of peptone, and the fat is again liberated. The albuminous envelope of the fat-globules is dissolved, and the fat coalesces, forming larger drops, in which condition it passes into the duodenum. A portion of the water and some of the salts are absorbed in the stomach. The curd that has not been acted upon by the gastric juice, together with the water, salts, and carbohydrates that still remain, also pass into the intestine, where their digestion is completed. Boiling increases the digestibility of milk, the precipitate being deposited in a more flocculent form. If the milk is previously diluted with lime-water, barley-water, or one of the aërated waters, such as Vichy, the curds formed are smaller and softer, and the milk often rendered more palatable. Bread and crackers added to milk make a good mechanical diluent by mingling with it and maintaining a soft condition of the curds. The addition of alkalis may be resorted to with a

view to neutralizing the acids. This has the effect of coagulating the casein more slowly, and forming flocculi rather than cheesy masses.

The Color of Milk.—Various changes in the color of milk are not uncommon, the best known of which is blue milk, and while it rarely occurs in clean and well-kept dairies, it is not unfrequently seen in milk which is poorly handled and exposed to contamination. The color is due to the action of bacteria, one described as the *Bacillus cyanogenes* being perhaps most frequently present. The milk turns blue in spots and finally assumes a diffuse sky-blue color. Red milk may be due to the presence of blood due to injuries of the udder or mammary gland, to the cows having fed on plants containing red pigments, such as the madder plant, and more rarely to the action of bacteria, of which there are several that will produce a red color, the best known of which is the *Bacillus prodigiosus*. Green, yellow, chocolate, and black milk have been described, which are due to various forms of bacteria.

Slimy or Ropy Milk.—This is a very curious change which occasionally takes place in milk and is due to the action of bacteria, one described as the *Bacillus lactis viscosi* being perhaps the best known. The change is seen also in certain diseases of the mammary gland. The milk becomes slimy or ropy, and can be drawn out into long thin threads, even as long as ten feet. In some countries, particularly Norway, slimy milk is produced by the addition of certain leaves to the milk and the product is esteemed as a food. The leaves contain the slime-producing bacteria. This change is also induced for the manufacture of certain cheeses, particularly Edam.

Bitter milk is very common, most frequently being caused by the cows having fed on plants containing bitter substances, chiefly the lupines; it occurs also during the last stages of lactation; is sometimes caused by abnormal conditions of the udder, and may be produced by the presence of certain forms of bacteria.

Alkaline Fermentation of Milk.—Milk which has been boiled does not sour through spontaneous fermentation; but if exposed to the air at ordinary temperature it becomes alkaline in reaction, sometimes develops a bitter taste, and then curdles. Later on the curd dissolves and a more or less clear fluid is left which has no resemblance whatever to milk. There are a number of different bacteria which may produce this change.

Flavors in Milk.—The flavor of milk may vary from time to time. This may be due to the food, such things as wild onion, even in small quantities, affecting the flavor of the milk very markedly, and disorders in the cow may also cause unusual flavors for a few days. Milk also absorbs odors, and if kept in an ice-box with odoriferous substances it may take on their flavors. The growth of bacteria also alters the taste of milk very materially, and may impart many different flavors to it.

Bacteria in Milk.—Milk is a most excellent culture-media for bacteria, and most germs grow luxuriously in it at the expense of the quality of the milk. The changes produced are largely those of decomposition, and many of them are exceedingly complex, resulting in the production of changes in flavor, odor, color, and the quality of the milk. The proteins may become decomposed, the sugar converted into gases, alcohol, or acids, while the fats are but little changed.

The number of bacteria in milk varies greatly, the very best milk containing but a few thousand bacteria per cubic centimeter, while very poor milk may contain many millions in the same quantity. In 1906 the milk sold in Washington, D. C., averaged 22,134,000 per cubic centimeter, and the year following there were 11,270,000. In Rochester, and many other cities, 100,000 is regarded as the limit in milk fit for human food. Milk which is certified by milk commissions ought not to contain more than 10,000 per cubic centimeter, although some commissions have adopted other numbers as the maximum limit. So-called inspected milk should not contain over 100,000 per cubic centimeter, and milk containing more than this should be regarded as unfit for human consumption, and especially so for infants and young children. Milk containing large quantities of bacteria must of necessity undergo considerable decomposition, and clinical experience teaches us that such milk is unfit to feed infants and may produce gastro-intestinal disease. The nature of the bacteria present is important, as disease-producing germs are dangerous to the public health. Milk which contains but few bacteria will, as a rule, contain no disease-producing bacteria, or but very few, while milk with very high bacterial counts is extremely liable to contain them. Almost all of the pathogenic bacteria grow better at or near the body temperature, and grow slowly, if at all, in milk which is cold enough to prevent the rapid growth of bacteria.

Each time milk is handled there is an increase in the number of bacteria, and they are also increased in separated and filtered milk. Under ordinary circumstances milk drawn from the udder of the cow contains bacteria which, with reasonably simple precaution, may be easily kept under 5000 per cubic centimeter. To keep these from increasing, the milk must be protected from further contamination and must be kept cold. The increase may also be influenced by pasteurizing and sterilizing, which have already been considered. Milk chilled to 45° or 40° F. will have little or no increase in the number of ordinary bacteria, and there is not much growth until it is warmed to 70° F.; after that conditions are more favorable to bacterial life, and between 80° F. and 98° F. the increase is enormous. When the temperature reaches over 100° F. the bacteria ordinarily found in milk do not grow well, and when the milk is heated to 125° F. the effect is to kill some of the germs, and an exposure of ten minutes at 160° F. will kill the majority of milk bacteria, but not the spores.

The source of the bacteria is of interest, as the milk as formed in the mammary gland in the healthy cow is free from germs. Small wounds of the udder may lead to bacterial invasion and the germs get into the mouths of the teats and so into the milk chamber, so that the first milk drawn should be rejected, and even the milk drawn later may contain some bacteria from the growth of them having extended up the milk ducts. The milk at the end of the milking is nearly or quite sterile. Inflammation of the udder and mammary gland may lead to very serious infection of the milk by disease-producing bacteria. During the milking the contamination is often surprisingly great. The number of bacteria in the air of the ordinary cow barn is very great, and if the hay loft is above it and the hay is thrown down just previous to milking the air may be clouded with germs. Particles of manure, hairs, and other foreign material may drop into the milk, and the milker's hands and dust from his clothing are also a frequent source of contamination. The bacteria from man are more dangerous to human health than those from the cow. If the milk pails and other receptacles are not sterilized, a goodly lot of bacteria will be found in the milk collected in the seams, and the cloth through which the milk is strained may add to the number if it is not sterile. The cooler, the cans, and the milk bottles, unless sterilized, all add their quota of bacteria, and every time the milk is handled or opened to the air additional contamination takes place. The sum total of all these may be very great, and the milk may start on its journey with more bacteria in it than would be safe for infants or invalids.

Various species of bacteria may be found in the milk ducts, and these differ in different cows, but certain species of streptococci are most often present. These are reasonably constant, and, as a rule, do not apparently produce any marked changes in the milk, although at times they are evidently the cause of changes to an alkaline reaction. The question of these streptococci and milk is deserving of further study, as they are not thoroughly understood, and as yet there is not a satisfactory method for distinguishing the non-pathogenic from the pathogenic.

Leukocytes may be found in the milk of healthy cows, but, as a rule, they are more numerous in the milk from diseased animals, and, if present in large numbers, a special examination should be made for garget and other diseases. Just what an average number would be cannot at this time be definitely stated, but the milk from the average herd kept under favorable conditions will contain over 100,000 per cubic centimeter. In diseases of the udder and in garget the number reaches 500,000 or over, and may extend into the millions.

The Souring of Milk.—With but few exceptions milk will sour in various lengths of time, and it may be regarded as a normal phe-

nomenon. As a matter of fact, milk which does not sour under ordinary conditions should be regarded with suspicion and tested for preservatives. When the milk reaches a certain stage of acidity it curdles. Curdling may be due to certain yeasts and moulds, and may be produced by rennet, but by far the most frequent cause is the lactic acid bacilli. Over a hundred different bacteria have been described as causing the souring of milk, but for the most part many of these are not commonly met with, and many of the others belong to one or two groups. By far the most common of these is what is ordinarily spoken of as the lactic acid bacillus, which does not produce gas, and which grows best in deep vessels, where the air is more or less excluded. Under favorable conditions these bacilli multiply rapidly, and the acid which they produce unites with the casein, and, when it reaches a certain percentage, it precipitates. Heat will hasten this, as is frequently demonstrated by the curdling which takes place on heating or adding nearly turned milk to hot tea or coffee. Milk soured by the lactic acid bacillus has a firm clot with a little whey on top and is free from gas. When the curd is broken up by shaking, it separates from the whey and sinks to the bottom. Such milk has a pleasant acid taste and is much used for food, either as clabber or curds and whey or cottage cheese. Another group of acid-producing bacteria grow best in milk which is well aërated, as that in shallow pans, and it produces gas, so that the curd is broken up and contains gas bubbles. These bacteria are a source of trouble to manufacturers of cheese. The changes produced in milk by the first group of lactic acid bacilli are of value in the manufacture of butter and cheese, but are unfavorable to the average milk dealer and consumer, and much of the care devoted to milk is directed against the growth of these organisms.

There is a popular belief that a thunder shower will sour milk. The fact seems to be pretty well demonstrated that the climatic conditions which produce thunder showers are those favorable to the growth of the bacteria which sour milk; and during the hot weather milk frequently sours apart from thunder storms, and also that milk cooled immediately after milking and kept properly cooled will not sour during a thunder storm.

Milk Production.—The production of milk which will keep a reasonable length of time and is free from objectionable features is a comparatively simple matter, but it requires care and constant supervision, and is best undertaken by persons trained in dairying. The first consideration is the cow herself, and, to produce good, pure milk, the cow must be healthy and must be kept clean. Sick cattle should be separated from the herd, and if a herd is to be kept free from tuberculosis, no cow should be added to it without first having been tested by tuberculin, and the entire herd should be tested from

time to time. The cow should be groomed regularly, the same as a horse, the oftener the better, and this reduces the bacterial contamination of milk very materially. Some dairymen cut off the longer hairs about the flanks and tail to lessen the danger of having them soiled with feces. The grooming should be done before milking, and the cow should not be allowed to lie down until she has been milked. The stables should be clean, light, and airy, and a special milking room is desirable unless the barn is of good construction and of sufficient size. Anything which stirs up dust should be avoided. The barnyard should be kept clean and drained. The employees should be healthy and clean, and the hands should be thoroughly scrubbed before milking. Many large dairy farms supply sterile suits to their employees to be worn at milking time. No one who has, or who has recently had, or who is associated in any way with any contagious disease, should be allowed to have anything whatever to do with milk production.

The milk pails and all milk receptacles should be kept clean and scalded as thoroughly as possible, and sterilizing with live steam should be done wherever practicable. The water supply of the dairy is of great importance, and many large dairy companies now insist upon special examination of the water and water-supply before receiving milk from farms.

Specially constructed milk pails, which, in a large measure, prevent the dirt and dust from falling into the milk, are sometimes used, and assist in reducing the contamination of the milk.

Milk Standards.—The Committee appointed by the New York Milk Committee suggests the following standards for large cities. Smaller towns may modify the standards according to the length of time the milk is kept and the distance it is transported before delivery.

Grade A.

Raw milk.—Milk of this class shall come from cows free from disease as determined by tuberculin tests and physical examinations by a qualified veterinarian, and shall be produced and handled by employees free from disease as determined by medical inspection of a qualified physician, under sanitary conditions, such that the bacterial count shall not exceed 10,000 per cubic centimeter at the time of delivery to the consumer. It is recommended that dairies from which this supply is obtained shall score at least 80 on the United States Bureau of Animal Industry score card.

Pasteurized milk.—Milk of this class shall come from cows free from disease as determined by physical examinations by a qualified veterinarian, and shall be produced and handled under sanitary conditions, such that the bacteria count at no time exceeds 200,000 per cubic centimeter. All milk of this class shall be pasteurized under official supervision, and the bacteria count shall not exceed 10,000 per cubic centimeter at the time of delivery to the consumer. It is recommended that dairies from which this supply is obtained shall score at least 65 on the United States Bureau of Animal Industry score card.

Grade B.

Milk of this class shall come from cows free from disease as determined by physical examinations, of which one each year shall be by a qualified veterinarian,

and shall be produced and handled under sanitary conditions, such that the bacteria count at no time exceeds 1,000,000 per cubic centimeter. All milk of this class shall be pasteurized under official supervision, and the bacterial count shall not exceed 50,000 per cubic centimeter when delivered to the consumer.

It is recommended that dairies producing grade B milk should be scored, and that the health departments or the controlling departments, whatever they may be, strive to bring these sources up as rapidly as possible.

GRADE C.

Milk of this class shall come from cows free from disease, as determined by physical examinations, and shall include all milk that is produced under conditions such that the bacterial count is in excess of 1,000,000 per cubic centimeter.

All milk of this class shall be pasteurized, or heated to a higher temperature, and shall contain less than 50,000 bacteria per cubic centimeter when delivered to the consumer.

Whenever any large city or community finds it necessary, on account of the length of haul or other peculiar conditions, to allow the sale of grade C milk, its sale shall be surrounded by safeguards such as to insure the restriction of its use to cooking and manufacturing purposes.

The Transportation and Delivery of Milk.—This cannot be fully considered here, but it may be stated that the milk should be transported in sterile cans or bottles, that the pouring of milk from one can to another or to bottles should only be allowed in a room provided especially for that purpose, free from dust and other source of contamination. The milk should be kept cold the entire time until it reaches the consumer, and by him until used. The selling of milk from open cans in grocery and provision shops should be prohibited. The safest method of marketing milk is in sealed bottles, and, unless some other solution of the problem offers, this should be the only way. Selling from cans, the way it is done in the United States, is open to a number of objections, but the public has not been educated to demand pure bottled milk, although much has been done in this direction.

The Handling and Care of Milk.—As we have seen, the production of milk reasonably free from bacteria is a question of cleanliness, and the question of handling it is reduced to cleanliness of utensils, protection of the milk from contamination by dust and dirt, and keeping it cool. The milk should be cooled immediately after milking, and this is most conveniently accomplished by using a milk cooler, of which there are many different models, using cold water, and it should be kept cold until used. Various devices for keeping milk by heating it to over 110° F. have been advised, but while most bacteria will not grow at this temperature, some undoubtedly do, and having seen severe diarrheas caused in infants by keeping milk warm at night, we advise against this practice in the present state of our knowledge of bacteria growing at high temperatures.

The Adulteration of Milk.—The most frequent adulteration of milk consists in removing part of the cream and adding water. In other instances good milk and skim milk are mixed together. In both

instances the consumer is robbed by paying for an article of food which does not have the nutritive value it is commonly supposed to possess. The addition of water brings the added danger of contaminating the milk, as a milk dealer sufficiently unscrupulous to add water to his milk would be apt to disregard the character of water used, and, as a matter of fact, a number of typhoid epidemics have been caused in this way. Milk is artificially colored, but this practice is not as common as is popularly supposed. Almost all communities have laws forbidding the adulteration of milk in this way.

The Use of Preservatives.—Chemical preservatives are frequently added to milk to prevent the growth of bacteria, and it is frequently done after the milk is partially spoiled. The most commonly used articles are formaldehyd, boric acid, borax, salicylic acid, and benzoic acid. Only small amounts are needed to check the growth of bacteria, but the unscrupulous dealer usually adds a great deal. Milk which does not sour in a reasonable length of time under favorable conditions for souring should be tested for preservatives. The use of all such preservatives should be prohibited by law. The so-called Buddeized milk has had hydrogen peroxid added to it, which sterilizes it, and the peroxid is gradually decomposed into oxygen and water. This process is not to be commended.

The Examination of Milk.—The milk should be thoroughly mixed so as to obtain a fair sample, but if the fat separates in small lumps of butter, another sample should be secured. Milk should adhere slightly to the sides of the glass from which it is poured, and not run off like water.

Fat Tests.—The Babcock test is the best method, but requires the use of a centrifugal machine; small ones, however, may be obtained for office use. The amount of fat in the milk may be definitely determined in ten or fifteen minutes by using this test, which is made by putting a definite amount of milk or cream in a special graduated bottle, adding sulphuric acid, and shaking the mixture until it becomes dark in color, then placing the bottle in a centrifugal machine and running it until the fat is entirely separated. The exact percentage can be read off after adding sufficient warm water to bring the fat up to the graduation on the bottle. A simple method, but not a very accurate one, is to use a creamometer, which is a tall, graduated glass cylinder. This is filled with milk and allowed to stand for about twenty-four hours. The process may be hastened by heating to 100° F. and then placing the creamometer in cold water. Another method is to fill the creamometer half full of milk and then add warm water. The reading will in this case have to be doubled.

The Specific Gravity.—This is best taken by the Quevenne lactometer, which has a thermometer enclosed in it which shows both the

specific gravity and temperature of the milk. The milk, to get accurate and uniform results, is tested at 60° F. The specific gravity of milk varies between 1.029 and 1.033, and sometimes there are great variations. The specific gravity may be increased if the cream is removed, and if water is added the specific gravity is decreased. A favorite method of adulterating milk is to remove part of the cream and then add sufficient water to make the specific gravity normal. The lactometer shows only the specific gravity of the milk, and while sometimes adulteration may be detected by it, it is not a certain test.

Estimation of Protein.—Boggs[1] has suggested the following test: Use phosphotungstic acid, 25 grams, and distilled water 125 c.c.; after thorough solution is obtained there is added hydrochloric acid (conc.), 25 c.c., diluted with distilled water, 100 c.c. This yields 250 c.c. of a 10 per cent. solution of phosphotungstic acid in about 3 per cent. hydrochloric acid. The solution is quite stable if kept in a dark bottle and gives satisfactory results after months of standing. It is desirable that the components be mixed as indicated, *i. e.*, the well diluted hydrochloric acid added after solution of the phosphotungstic acid, in order to avoid precipitation.

The sample of milk to be tested is diluted with water, using standard pipets and flasks to secure maximum accuracy. Esbach's tables of standard patterns reading from 1 to 7 grams per liter are more satisfactory.

The diluted milk is poured into the tube to the mark U, being careful to read from the bottom of the meniscus. The phosphotungstic acid solution is added to the mark R, the tube corked, and slowly inverted twelve times to secure thorough mixing, care being had to avoid shaking roughly and thus mixing air in the fluid. The tube is then placed in a rack for twenty-four hours, and the percentage read off at the level of the top of the precipitate. Fractions of percentage between the graduations are readily judged by the eye. At dilutions of one part in ten, percentage of protein is read directly from the scale, while if the solution be one in twenty, we multiply the reading by two, if one in five, we divide by two.

The optimum dilution for human milk is 1 in 10. That for cows' milk, 1 in 20. If the protein content be found extremely low we may use 1 in 5 for human milk and 1 in 10 for cows' milk.

As temperature has a definite influence on the volume of the precipitate, it is desirable that the tubes be not exposed to extremes, although the differences noted in this precipitate were not nearly so great as when Esbach's solution was used.

No considerable variation was found in volume of precipitates, with temperatures ranging between 15°–25° C. (59°–77° F.), while in the

[1] Bulletin of the Johns Hopkins Hospital, October, 1906.

thermostat at 37° C. all floated, and in the ice-box at 5° C. (41° F.) all read appreciably higher than at room temperatures, averaging 20° C. (68° F.).

The minimum volume of the precipitate is reached in twenty-four hours.

Tests.—The Acid Test.—From the time of milking until it sours the acidity of milk is constantly increasing, and while no definite standard has been adopted as the maximum acidity which should be accepted by a consumer, it furnishes a simple means of testing milk. Farrington, of Wisconsin, has had tablets made of a definite quantity of some alkali, such as caustic potash or soda, containing a little phenolphthalein, which is colorless in acid solutions and pink in alkaline solutions. The tablets are made of such strength that if two of them turn one ounce of milk pink, such milk, with proper care, should keep a reasonable length of time.

Hydrogen peroxid may be detected in milk by the use of a solution of titannic acid (titannium hydrate) dissolved in sulphuric acid. This is added to a few cubic centimeters of milk, and if the peroxid is present coloration appears, but varies between a light yellow and a deep orange, according to the amount of peroxid present. A somewhat similar reaction takes place from milk containing salicylic acid.

Formaldehyd is best tested by using either Hehner's or Leach's test. They are based on the appearance of a violet color when concentrated sulphuric acid or hydrochloric acid containing a trace of iron is added to the milk.

Hehner's Test.—To a few cubic centimeters of concentrated sulphuric acid, to which a trace of some ferric salt has been added, add the milk to be tested so as to form a distinct layer on top of the acid and allow to stand. If formaldehyd be present, even one part to a million of milk, a violet coloration will take place at the junction of the two liquids.

Leach's Method.—Dilute the milk with an equal volume of water and add for each cubic centimeter of the diluted milk 1 c.c. of concentrated hydrochloric acid containing 1 c.c. of 10 per cent. ferric chlorid solution to each 500 c.c. of acid. The mixture is heated in a casserole over the bare flame to 80° or 90° C., rotating to break the curd which forms. If formaldehyd be present, a violet color will appear.

Detection of heated milk.—*Storch's method.*—Five cubic centimeters of milk are poured into a test tube; a drop of weak solution of hydrogen dioxide (about 0.2 per cent.) which contains about 0.1 per cent. sulphuric acid, is added, and two drops of a 2 per cent. solution of paraphenylendiamin (solution should be renewed quite often), then the fluid is shaken. If the milk or the cream becomes, at once, indigo blue, or the whey violet or reddish brown, then this has not been

heated or, at all events, it has not been heated higher than 78° C. (172.5° F.); if the milk becomes a light bluish gray immediately or in the course of half a minute, then it has been heated to 79° to 80° C. (174.2° to 176° F.). If the color remains white, the milk has been heated at least to 80° C. (176°F.). In the examination of sour milk or sour buttermilk, lime water must be added, as the color reaction is not shown in acid solution.

Arnold's guaiac method.—A little milk is poured into a test tube and a little tincture of guaiac is added, drop by drop. If the milk has not been heated to 80° C. (176° F.) a blue zone is formed between the two fluids: heated milk gives no reaction, but remains white. The guaiac tincture should not be used perfectly fresh, but should have stood a few days and its potency have been determined. Thereafter it can be used indefinitely. These tests for heated milk are only active in the case of milks which have been heated to 176° F. or 80° C. (Jensen's Milk Hygiene, Pearson's translation, p. 192.)

Microscopic test for heated (pasteurized) milk—Frost and Ravenel.—About 15 c.c. of milk are centrifuged for five minutes, or long enough to throw down the leukocytes. The cream layer is then completely removed with absorbent cotton and the milk drawn off with a pipette, or a fine-pointed tube attached to a Chapman air pump. Only about 2 mm. of milk are left above the sediment which is in the bottom of the sedimentation tube.

The stain, which is an aqueous solution of safranin 0, soluble in water, is then added very slowly from an opsonizing pipette. The important thing is to mix stain and milk so slowly that clotting does not take place. The stain is added until a deep opaque rose color is obtained. After standing three minutes, by means of the opsonizing pipette, which has been washed out in hot water, the stained sediment is then transferred to slides. A small drop is placed at the end of each of several slides and spread by means of a glass spreader, as in Wright's method for opsonic index determinations.

In an unheated milk the polymorphonuclear leukocytes have their protoplasm slightly tinged or are unstained.

In heated milk the polymorphonuclear leukocytes have their nuclei stained. In milk heated to 63° C. or above, practically all of the leukocytes have their nuclei definitely stained. When milk is heated at a lower temperature the nuclei are not all stained above 60° C. The majority, however, are stained.

Cream.—When milk is allowed to stand undisturbed, the fat droplets, being of lower specific gravity than the remainder of the milk, gradually rise to the top, and the longer the milk stands, up to a certain limit, the more cream will be found. As far as the composition of cream goes, it is most easily remembered as regarding it as milk containing a large amount of fat. The percentages of the other ingredients being for all practical purposes about the same as in milk or a

Whole milk.	Cream. I.	II.	III.	IV.	V.
Fat 4.00	8.00	12.00	16.00	20.00	40.00
Sugar 4.50	4.50	4.20	4 05	3.90	3.00
Protein 3.50	3.40	3.30	3.20	3.05	2.20
Salts 0.75	0.70	0.65	0.60	0.55	0.45

little lower. Creams are usually spoken of with reference to the amount of fat which they contain, so one speaks of a 16 per cent. cream, 20 per cent. cream, etc. The composition of these is given in the table from Holt shown above.

The cream which rises on average milk after twenty-four hours usually contains about 16 per cent. fat, and is spoken of as gravity cream. Some gravity cream may contain as much as 18 or 20 per cent. fat. The richer creams are obtained by centrifugalizing the milk. This has the advantage that cream may be put on the market a short time after milking, but it has the disadvantage that the fat globules may be broken up and fused, so that a thin layer of fat may be found on top of the bottle.

The upper part of the cream, after standing, is richer in fat than the lower part, and this is true of the milk taken as a whole. The variations are well shown in the following table from Holt:

Percentage of fat in—	After four hours.	After eight hours.	Over night.
Upper 4 oz.	20.50	21.25	22.00
Second 4 oz.	6.00	6.50	6.50
Third 4 oz.	1.50	1.40	1.00
Fourth 4 oz.	1.20	1.00	0.30
Fifth 4 oz.	1.00	1.00	0.20

The fat droplets in cream vary in size in the different varieties of cows. In the Alderneys and Guernseys the droplets are larger, less uniform in size, and more numerous than in milk from the ordinary milch cow. The small uniform fat droplets of milk from average herds is to be preferred in infant feeding. Ordinarily, if average milk has stood until the cream has risen, the upper third of the milk in the bottle will contain about 10 per cent. fat and the upper half about 7 per cent. fat. Cream rises best on milk that has been cooled quickly after milking and which has been handled but little. Milk which has been shaken up frequently and frozen and thawed does not yield as much cream, nor as quickly.

Skim Milk.—This is the residue remaining after the removal of

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cream from ordinary milk, and differs from it in having most of the fat removed, and is slightly richer in casein and milk-sugar. It is easily digested by most people and is frequently sold as whole milk. The average composition of skim milk, according to Letheby, is as follows·

Water	88.0
Protein	4.0
Fats	1.8
Milk-sugar	5.4
Salts	0.8

Devonshire cream is more or less solid clotted cream, obtained by skimming milk after it has been heated slowly to not over 150° F. It is very extensively used in Devonshire, and is very nutritious, but less digestible than ordinary cream.

Butter.—Butter is made from milk by churning, which causes the fat globules in the milk to coalesce, thus forming a solid mass. Occasionally butter is made from other milk than that of the cow. Butter is made most rapidly from cream that has been ripened from twelve to twenty-four hours, and churned at a temperature between 65° and 70° F. In this way butter may be separated in from twelve to thirty minutes. The process of ripening has been carefully studied, and it has been found that the bacterial flora of a creamery varies with the season of the year, and also the taste and odor of the butter varies correspondingly. Instead of depending on chance bacterial invasions of the milk, which may produce at times unpleasant flavors, it is the practice in many creameries to inoculate the milk with a culture of bacteria known to impart a desirable flavor to the butter. In this way a saving is brought about and the quality of the butter improved.

When butter is kept too long it becomes rancid, and this is due chiefly to the fermentation of the small amount of casein remaining in the butter liberating fatty acids. To avoid this the butter should be kept cold. Salting is largely used for preventing this fermentation. The amount used should not exceed 2 per cent., and it should be worked into the butter so that no undissolved particles remain. The unsalted or sweet butter is largely used in Europe, but there is not a great demand for it in the United States. Butter is often colored, largely because the public still like a dark, yellow color. Annatto is largely used for this purpose. The United States standard for butter is that it shall not contain more than 16 per cent. of water, nor less than 82.5 per cent. of butter fat. Approximately butter may be said to consist of—

Fat	90.0
Water	10.0
Sugar or milk	0.5
Casein	0.5

On account of the ease with which fresh butter is digested, it is one of the most valuable of the fatty foods.

Renovated Butter.—This is made from butter which has become rancid, by melting and washing with water. This has no flavor, and so it is given a butter flavor by mixing with a certain amount of sour cream.

Testing Renovated Butter and Oleomargarin.—Renovated butter and oleomargin may be distinguished from ordinary butter by boiling a small amount in a small pan or tablespoon. It should be melted slowly, and stirred with a wooden splinter or match stick several times during the boiling. Genuine butter boils with little noise and produces an abundance of foam, while renovated butter and oleomargarin boil noisily and sputter like a mixture of grease and water, and produce less foam.

The Waterhouse Test.—Oleomargarin may also be distinguished from butter and renovated butter by the Waterhouse test.

Sweet skimmed milk is used, filling a half-pint cup half full, then heat this nearly to boiling, and add a slightly rounded teaspoonful of the material to be tested. Stir with a wooden rod and continue heating until the milk boils up, then remove from the heat and cool in a pan containing rather large fragments of ice and a little water. When the cup is placed in the pan the water should reach on the outside of the cup to one-fourth of the height of the milk within. The contents of the cup should be stirred rather rapidly and continuously, and about once a minute the cup should be moved about in the ice so as to facilitate cooling. If the sample is oleomargarin the fat gathers into one soft lump, and if it is butter the fat becomes granulated and cannot be collected. When the test is properly carried out the distinction is very marked.

Buttermilk.—The residue left in the churn is called buttermilk, and is largely used as a beverage, as it is nutritious and easily digested. It contains the casein of the milk in a finely coagulated form, has a pleasant acid taste, and contains lactic acid bacilli. The buttermilk left after churning fresh milk has approximately the same composition as skimmed milk. Buttermilk from ripened cream varies somewhat. Wiley gives the following analyses:

	From sweet cream.	From sour cream.
Water	89.74	90.93
Fat	1.21	0.31
Milk-sugar	4.98	4.58
Protein	3.28	3.37
Ash	0.79	0.81
Acidity	——	0.80

A preparation similar to buttermilk is also frequently made from the whole milk by inoculating with lactic acid bacilli. This is a pleasant, nutritious drink, much in vogue at the present time. It is

useful in feeding invalids, especially those with certain forms of gastric and intestinal disorders, and in feeding infants. Compressed tablets of lactic acid bacilli may be obtained on the market, and, while less satisfactory than the fresh cultures, may be used where the latter are unobtainable. Conserved buttermilk, made somewhat after the manner of condensed milk, is also used, especially for infant feeding. Dried buttermilk has also been placed on the market.

Bacillus Acidophilus and Bacillus Bulgaricus Milks.—Metchnikoff advocated the use of the Bacillus bulgaricus to prevent intestinal putrefaction, the products of which he thought responsible for arteriosclerosis and old age; he also believed that it would inhibit the growth of the proteolytic bacteria responsible for the putrefaction. More recently there have been numerous reports that the Bacillus acidophilus, normally present in the intestinal tract could be greatly increased in number either by feeding milk sugar, upon which it thrives, or living cultures of the organism in conjunction with the ingestion of milk sugar. There is now some doubt as to the possibility of making the Bacillus bulgaricus grow in the intestinal tract, and professional favor is now bestowed upon the acidophilus.

The milk is sterilized for about an hour by boiling, and when cool it is inoculated with a starter of a pure culture of the organism. It is incubated at 35° to 37° C. In twenty-four hours the product is not unlike buttermilk. It may be made with whole or skimmed milk. In the home the milk may be prepared as follows: Boil a quart of milk for ten minutes in a double boiler. Allow to cool until the temperature is lowered to any point between 96° and 105° F., or, if a thermometer is not available, until the inside pot, which contains the milk, is comfortable to the touch of the palm of the hand. The pot should at all times be covered except when taking the temperature of the milk with a thermometer.

Add one tablespoonful of liquid culture, using a spoon as soon as it has cooled after sterilization by boiling. The milk should then be maintained at 100° F., which temperature may be suggested as the optimum, although any temperature between 96° and 105° F. will assure growth of the organism.

Curdling into a solid clot should take place within twenty-four to thirty-six hours, when the product is ready for use.

The required incubating temperature, as just outlined, can be secured by carefully adjusting the gas-burner under the boiler. The danger of contamination is remote, but if any gas-bubbles develop, a contamination is present and the milk should be discarded.

Rettger and Cheplin's Method of Preparing Acidophilus Milk.—Sweet skimmed milk is sterilized by autoclaving at an extra pressure of 15 pounds for thirty minutes. The cooled milk is inoculated with a pure culture of preferably mixed strains of Bacillus acidophilus

under strict laboratory precautions and incubated at 35° to 37° C. for twelve to twenty-four hours. As soon as the milk has undergone coagulation it is removed and placed in the refrigerator. It should be well shaken to break the curd, and if it should become advisable to add lactose, this may be added at the time the milk is taken. It is well to shake the lactose and milk well and allow the mixture to stand for one-half hour more in a cool place.

Eggston and Norman's New Technic for Preparing Acidophilus Milk.[1]—After experimenting for some time, Eggston and Norman have been able to produce a milk that is white in color, of a non-lumpy consistency, with practically no odor, and in which they can regulate the richness to suit the requirement of the patient. The milk may be made with an acid or slightly sweetish taste. This can be done without altering the bacterial count. The milk is not better than Rettger's, but they find it more acceptable to the rank and file of patients. They prepare the white acidophilus milk in the following way: One pint of water is placed in a liter container. If one wishes a sweet-tasting milk, a heaping teaspoonful of lactose is added to the water, which is then autoclaved for twenty minutes under 25 pounds of pressure. This caramelizes the lactose. The water is then cooled. A pound tin of unsweetened evaporated milk is punctured and its contents added to the autoclaved water, observing a sterile technic. The mixture is inoculated from a stock culture of Bacillus acidophilus under aseptic technic, shaken, and incubated for twenty-four hours at 99° F. The curd formed will be soft, white, and slightly separated from the whey at the top. Shake the flask to break the curd, refrigerate, and the milk is ready for use. The acidity of the milk is controlled by the incubation period—the longer it incubates, the greater the acidity. The fat content may be regulated by varying the amount of water and evaporated milk.

Acidophilus milk should not be used to seed a new lot of sweet milk because the cultured milk may not always represent an absolutely pure culture of Bacillus acidophilus, and its use for seeding would invite a rapid multiplication of the contaminating forms during incubation of a new batch.

The two organisms have much in common, but the bulgaricus produces more acid (about 3 per cent.) in twenty-four hours to 1 per cent. by the acidophilus. Acidophilus can make acid out of maltose, which the bulgaricus cannot. Bulgaricus cannot be made to grow in the intestinal tract, and strains introduced are said to die out.

It has been demonstrated by Rettger and Cheplin[2] that by feeding with culture of the Bacillus acidophilus the intestinal flora may be so altered as to convert it from a putrefaction proteolytic to a fermen-

[1] American Medicine, December, 1922, p. 645.
[2] Intestinal Flora, Yale University Press, 1921.

tation or aciduric type. Acidophilus milk is used in much the same indications as were recommended for bulgaricus milk. One feels like saying *"Le roi est mort, vive le roi."* Intestinal putrefaction, various forms of diarrhea, and chronic constipation are the chief uses.

Bonnyclabber.—This is soured milk in which the curd and whey are served in the same dish, and usually eaten with the addition of sugar. Curd and whey or junket is milk where the coagulation has been brought about by rennet. In many instances the whey is removed and used as a food for invalids and infants.

Cheese.—Cheese is made of the curd and a certain proportion of fat of milk, and varies in composition and consistence according to the method employed in the manufacture. The simplest form of cheese is the so-called cottage cheese, in which the curd is separated from the whey and eaten a short time after it is made. The other cheeses are kept a certain length of time to insure ripening. Sometimes the coagulation is produced by rennet and sometimes by lactic acid, while various forms of bacteria growing in the cheese and also certain moulds impart to the different varieties their peculiar flavors. Some cheeses are hard and some are soft, the difference being due to the amount of pressure used in hardening them. As a rule, the harder cheeses keep very much longer than the softer ones. The average composition of cheese, as shown by Parks, is as follows:

Water	36.0
Protein	31.0
Fats	28.5
Salts	4.5

Cheese is a nutritious and agreeable food, but some people find it difficult of digestion. As a rule, the harder the cheese, the more indigestible it is. Like milk, cheese may contain certain poisonous substances due to bacterial action, and severe poisoning may follow the eating of such cheese. In recent years the study of the manufacture of various cheeses has been carried on, so that Roquefort and Camembert and other foreign cheeses are imitated with considerable success in the United States. The artificial coloring of cheese is still very common in the United States, and should be prohibited by law. Cheese is sometimes adulterated, and a cheap cheese, known as filled cheese, is made by adding neutral lard to the milk to replace the butter fat. In the United States such cheese is taxed and must be branded as such.

Condensed Milk.—This is manufactured by heating the milk to 212° F. to sterilize it and then evaporating in a vacuum until it becomes thick and jelly-like. To this considerable amounts of cane-sugar are added. In some cities fresh condensed milk may be obtained which has not had sugar added to it. The composition of condensed milk is as follows:

	Total solids per cent.	Protein per cent.	Fat per cent.	Milk-sugar per cent.	Cane-sugar per cent.
Unsweetened condensed milk.	40	12	12	16	0
Sweetened condensed milk....	80	12	12	16	40

The Borden Company have furnished the following analyses:

Eagle Brand Condensed Milk.

Fat	9.82
Milk-sugar	12.49
Protein	8.80
Ash	1.90
Cane-sugar	40.50
Water	26.49

Borden's Evaporated Cream.

Milk-sugar and protein	20.93
Fat	9.52
Ash	1.90
Water	67.65

Evaporated cream is merely a trade name to distinguish unsweetened condensed milk from sweetened condensed milk. A condensed cream would, of course, be butter.

Condensed milk is largely used as a substitute for fresh milk by many people, and is of especial value in the tropics and on voyages, as well as being a useful food, under certain conditions, for infants. It is easily digested, and the better brands are reasonably pure; but, in the dilutions usually used, it is too high in sugar percentage and too low in fat. It produces fat, pale, flabby babies, with a tendency to rickets, scurvy, and a lowered resistance to infections. On the other hand, it is most valuable in infants with feeble digestive powers and those who are not gaining in weight; in hot summer weather it is to be recommended where the fresh milk is of questionable purity. (See Infant Feeding.) It should be remembered that condensed milk may be made from dirty milk, and so be objectionable, and that it may contain large numbers of bacteria.

Another method of conserving milk, known as the Campbell method, has been recently introduced, and the product is now obtainable in some places. Pure milk is placed in a concentrating vat and warmed to 140° F. A blast of filtered air is driven through it for about three hours, or until the original volume is reduced to one-quarter. This is then bottled in sterile bottles. It may be used just as it is in coffee or tea, diluted one-half in place of cream, or with three times the amount of water in place of ordinary milk.

Dried Milks.—These are discussed under Infant Feeding.

Predigestion of Milk.—Milk may be partly or wholly predigested in order to render it more easily digestible for individuals suffering from gastro-intestinal disorders. This process is readily accomplished by adding an active preparation of pepsin to acidulated milk, and allowing the fermentation to proceed under the influence of heat at

the body-temperature by immersion in hot water. During this fermentation the casein is partly or completely converted into albumoses. If the process is allowed to continue too long, the milk becomes bitter. For this reason it is ordinarily removed from the hot water after a few minutes, and is placed upon ice, which prevents further fermentation. In order to predigest milk in alkaline solution pancreatin is substituted for pepsin; pancreatization of milk has now largely replaced peptonization. In order to effect pancreatization of milk, Fairchild's peptonizing tubes are ordinarily employed. These tubes contain five grains of pancreatic extract and fifteen grains of sodium bicarbonate. Each tube contains sufficient powder to digest one pint of milk. Another easy method of partially pancreatizing milk is by the use of Fairchild's peptogenic milk powder. First dissolve the powder in the water by rubbing and stirring with a spoon, then add the milk and cream; mix well; heat in a saucepan, with constant stirring until blood-warm—not too hot to be agreeably borne by the mouth; keep at about this temperature for ten minutes; then bring quickly to boiling-point; pour at once into clean bottle, shake thoroughly, cork tightly, and place directly on ice or in a very cold place.

Where the taste of pancreatized milk proves objectionable, the addition of carbonated waters, or of small quantities of coffee, may render it more palatable.

The digestibility of milk may be increased by the addition of hot or cold water, carbonated waters, such as Vichy or Apollinaris, lime-water, oatmeal or barley-water, or farinaceous foods, such as arrowroot or flour; occasionally small quantities of salt or sodium bicarbonate are helpful.

Kumiss, Kefir, and Matzoon.—Kumiss is a fermented drink prepared by both lactic acid and alcoholic fermentation. For many centuries it has been made from mares' milk by the natives living near the shores of the Caspian Sea. The milk is obtained from a special breed of mares, the animals being fed very carefully. The milk is mixed with a kumiss ferment, the lactic acid ferment converting some of the sugar into lactic acid, while another part of the sugar is converted into alcohol and carbonic acid; a small quantity of casein is digested. The milk is constantly agitated, and the fermentation allowed to proceed for a period of twenty-four hours or more.

Kumiss is an acid, effervescing drink, and contains a very small proportion of alcohol. It is very easily digested, being much more digestible than milk. The casein is so finely divided that lumps cannot be formed in the stomach, and it is easily acted upon by the gastric secretion. In the United States it has been prepared from cows' milk, to which the ferment has been added.

Kumiss Cure.—In certain parts of Russia this form of cure is not uncommon. It consists in drinking small quantities of kumiss and

gradually increasing them until large quantities are taken. Kumiss cures have been prescribed in chronic gastro-intestinal catarrhs and chronic catarrhs of the respiratory tract.

Kefir resembles kumiss, and is often used as a substitute for it. It was originally made in the Caucasus from cows' milk fermented with *Saccharomyces mycoderma,* lactic acid fermentation going on at the same time. Alcohol, lactic acid, and albumins are formed as a result of the fermentative processes. The casein is partly digested. Tablets of the kefir ferment have been prepared by Jurock, and are sold under the name of kefilac tablets. They render the home manufacture of kefir an easy matter. (See Recipes.)

Yoghurt Milk.—Yoghurt has been used in the East for a long time, but has only recently been introduced in this country. It is a sour Bulgarian milk, and is highly nutritious, and can be used as a substitute for kumiss or kefir. The fermentation in this form of milk is generated by a ferment of a mixture of forms of bacteria containing mainly the *Bacillus bulgaricus.*

The composition of yoghurt is: Protein, 7.4; sugar, 9.4; fats, 7.20; salts, 1.38; alcohol, 0.20; lactic acid, 0.8. Yoghurt is very digestible, inasmuch as the casein and albumin contained therein are rendered soluble as peptones and albumoses, and the lime salts are in solution to 68 per cent.

This preparation of milk has become especially prominent due to the fact that Metchnikoff describes a life-prolonging effect to it, basing this belief on the fact that in Bulgaria, where yoghurt is much used, a large number of consumers of this preparation are said to live above 100 years of age. While the conclusions of Metchnikoff are probably not entirely correct, it is a well-known fact that individuals often thrive on this food. Preparations much like yoghurt may be prepared from the Bulgarian bacillus tablets made by the various manufacturing chemists.

Goat's Milk.—This is discussed under Infant Feeding.

Matzoon.—In this form of milk lactic acid is produced by fermentation with a ferment obtained from Syria. It it thicker than kumiss and does not contain alcohol.

Kumiss, kefir, and matzoon are agreeable forms of milk foods, are easily digestible, and are especially useful in those cases in which milk cannot be taken or is not well borne. The following table is taken from Hutchinson and gives the composition of kumiss, kefir, etc.:

	Proteid.	Sugar.	Fat.	Salts.	Alcohol.	Lactic acid.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Kumiss	2.2	1.5	2.1	0.9	1.7	0.9
Kefir	3.1	1.6	2.0	0.8	2.1	0.8
Mares' milk	2.6	5.5	2.5	0.5		
Cows' milk	3.3	4.8	3.6	0.7		
Buttermilk	3.8	3.3	1.2	0.6	. .	0.3

EGGS

The eggs of the hen are consumed in largest numbers, but those of the duck, turkey, guinea-hen, and of some wild fowl are also eaten. The eggs of domestic fowls vary in size and appearance, but their composition is about the same.

The shell of a hen's egg constitutes 11 parts, the white 57 parts, and the yolk 32 parts of the entire weight of the egg. The following table, taken from Langworthy,[1] shows the composition of hens' eggs, cooked and raw; of white-shelled and of brown-shelled eggs; and of the yolk and white of the egg of the duck, goose, turkey, and guinea-fowl:

Average Composition of Eggs.

	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Hen:							
Whole egg as purchased	11.2	65.5	11.9	9.30	..	0.9	635
Whole egg, edible portion	..	73.7	13.4	10.50	..	1.0	720
White	..	86.2	12.3	0.20	..	0.6	250
Yolk	..	49.5	15.7	33.30	..	1.1	1705
Whole egg boiled, edible portion	..	73.3	13.2	12.00	..	0.8	765
White-shelled eggs as purchased	10.7	65.6	11.8	10.80	..	0.6	675
Brown-shelled eggs as purchased	10.9	64.8	11.9	11.20	..	0.7	695
Duck:							
Whole egg as purchased	13.7	60.8	12.1	12.50	..	0.8	750
Whole egg, edible portion	..	70.5	13.3	14.50	..	1.0	860
White	..	87.0	11.1	0.03	..	0.8	210
Yolk	..	45.8	16.8	36.20	..	1.2	1840
Goose:							
Whole egg as purchased	14.2	59.7	12.9	12.30	..	0.9	760
Whole egg, edible portion	..	69.5	13.8	14.40	..	1.0	865
White	..	86.3	11.6	0.02	..	0.8	215
Yolk	..	44.1	17.3	36.20	..	1.3	1850
Turkey:							
Whole egg as purchased	13.8	63.5	12.2	9.70	..	0.8	635
Whole egg, edible portion	..	73.7	13.4	11.20	..	0.9	720
White	..	86.7	11.5	0.03	..	0.8	215
Yolk	..	48.3	17.4	32.90	..	1.2	1710
Guinea-fowl:							
Whole egg as purchased	16.9	60.5	11.9	9.90	..	0.8	640
Whole egg, edible portion	..	72.8	13.5	12.00	..	0.9	755
White	..	86.6	11.6	0.03	..	0.8	215
Yolk	..	49.7	16.7	31.80	..	1.2	1655

As may be seen from the foregoing table, the egg contains mainly protein and fats, in addition to water and mineral matter. The white and the yolk differ in composition, the white containing less protein and water than the yolk, and scarcely any fat and ash, whereas the yolk contains considerable fat and ash. The white is said to be pure protein; it is composed mainly of four albumins and a slight amount of carbohydrate. The albumins are ovalbumin, conalbumin, ovomucin, and ovomucoid, the ovalbumin being the main constituent.

[1] Farmers' Bulletin No. 128, United States Department of Agriculture.

The yolk of the egg is very complex in composition, and contains 15 per cent. of protein (vitellin), 20 per cent. of palmitin, olein, and stearin (the fatty elements), and 0.5 per cent. of coloring-matter, besides lecithin, nuclein, salts of iron, calcium, potassium, and magnesium; the total phosphorous equivalent in the yolk is slightly over 1 per cent., while that of the white is but 0.03 per cent. The shell of the hen's egg has no food-value; it consists mainly of mineral matter containing 94 per cent. of calcium carbonate.

The flavor of the egg is dependent in large measure upon the food eaten by the laying hen. Fresh eggs have the finest flavor. Langworthy[1] gives the following methods for testing the freshness of eggs: "'Candling,' as it is called, is one of the methods most commonly followed. The eggs are held up in a suitable device against a light. The fresh egg appears unclouded and almost translucent; if incubation has begun, a dark spot is visible, which increases in size according to the length of time incubation has continued. A rotten egg appears dark colored. The age of eggs may be approximately judged by taking advantage of the fact that as they grow old their density decreases through evaporation of moisture." According to Siebel, a new-laid egg placed in a vessel of brine made in the proportion of two ounces of salt to one pint of water will at once sink to the bottom. An egg one day old will sink below the surface, but not to the bottom, while one three days old will swim about just immersed in the liquid. If more than three days old, the egg will float on the surface, the amount of shell exposed increasing with age. If the egg is two weeks old, only a little of the shell will dip in the liquid. Penzoldt[2] gives the following table showing the digestibility of eggs:

2 soft-boiled eggs leave the stomach in 1¾ hours.
2 raw eggs leave the stomach in 2¼ hours.
2 poached eggs and 5 grams of butter leave the stomach in 2½ hours.
2 hard-boiled eggs leave the stomach in 3 hours.
2-egg omelet leaves the stomach in 3 hours.

Raw white of eggs contains something which enables it to resist digestion, but this antitryptic substance is destroyed by heating to 70° C. After it leaves the stomach it is badly digested in the intestines. Given in large amounts raw egg albumin is apt to produce diarrhea and flatulence, and at times appears to produce albuminuria. In man from 30 to 50 per cent. of raw egg albumin is lost as such in the feces. Cooked egg white, however, does not produce any of these ill effects, and even in large amounts 90 per cent. is utilized. Coagulation is produced at 70° C. The chief value of raw eggs is in the yolk, even though the use of raw egg white alone may be questioned.[3] All of the disadvantages of the raw egg albumin may be overcome by means of coagulation.

[1] Farmers' Bulletin No. 128.
[2] Hutchinson, Food and Dietetics, p. 152.
[3] Bateman, Amer. Jour. Med. Sci., June, 1917, p. 841.

Raw eggs are best taken directly from the shell, or they may be combined with milk broths or with coffee. In various diseases accompanied by loss of flesh and strength raw eggs in large numbers are prescribed, as many as 24 eggs being given in twenty-four hours.[1]

The palatability of the egg may be increased by flavoring it with sherry wine, orange, lemon, or grape juice, or by serving it in cream, cocoa, or coffee.

Egg-nog is prepared from milk and eggs, flavored with some alcoholic drink, and sweetened with sugar.

When allowed to remain in the air, eggs decompose from the entrance of germs through their shell. Decomposition may be prevented in various ways, such as by coating them with oil or varnish, packing them in sawdust, or placing them in cold storage or in certain solutions, such as salicylic acid and glycerin.

MEATS AND THE MEAT PREPARATIONS

Meat forms the fleshy or muscular parts of the body. It is one of the most important articles of food, and is the chief source of man's protein supply. Meat may be eaten raw or cooked. Raw meat, when well ground, is very easily digested.

Meat is composed of muscle-fibers held together by connective-tissue bands; between the muscle-fibers are bits of fat. As ordinarily seen, meat contains muscle tissue, connective tissues, blood-vessels, nerves, and lymphatics, together with a varying amount of fat. The more fat there is in meat, the less water and nitrogenous matter does it contain, and *vice versâ*. Cooking has the effect of rendering the connective tissues soluble, thereby causing a separation of the muscular fibers, allowing the digestive secretion to mingle more thoroughly with them. Cooking also enhances the flavor and appearance of the meat, but, on the other hand, causes a loss in fat and extractives. Cooking likewise destroys the micro-organisms that may be present in the meat, and thus renders it more wholesome.

Meat may be cooked in various ways—it may be boiled, stewed, roasted, or fried. Meat is boiled by placing it in cold water and subjecting it to a moderate heat for some time. In this way the connective tissue becomes gelatinized, and a portion of the organic salts, albumin, and extractives is dissolved. The longer the process is allowed to continue, the more tasteless does the meat become and the richer is the broth. This tasteless mass of meat has a high nutritive value, and, combined with the broth, constitutes a nutritious food. The process of stewing meat is accomplished by placing the meat in boiling water, by means of which the albumin on the surface is quickly coagulated, thus preventing the juice from escaping and so retaining the flavoring matter; the broth that is procured in this way

[1] Ely, "Fable of Egg," New York Med. Jour., November 14, 1903.

is very poor in quality. Meat is roasted by placing it in a very hot oven, the superficial layers thus becoming immediately coagulated, and so preventing escape of the juice. To broil meat, small bits are cooked over an open fire, the albumin of the surface being thus not only coagulated, but the inner fibers being cooked at the same time. Frying is accomplished by placing the meat in boiling oil; the surface albumin is at once coagulated, the juice is prevented from escaping, and the meat is rapidly cooked.

Digestibility of Meats.—The digestibility of meats is governed by many conditions: The age at which the animals eaten were killed, the length of time the meat is kept before eating, the care bestowed upon the animals during life, and the methods of preparing the meats for the table. Meats are most easily digested when stewed; frying renders them most indigestible. The flavor of meat varies with the condition of the animal from which it was obtained. The meat of mature animals is more pronounced and agreeable in flavor than that of younger cattle.

The following table, taken from Penzoldt, gives the relative digestibility of meat foods:

One to two hours:
200 gm. beef-juice.

Three to four hours:
230 gm. stewed young chicken.
230 gm. broiled partridge.
240 gm. stewed pigeon.
195 gm. roast pigeon.
250 gm. beef (raw or boiled).
250 gm. calf's foot, boiled.
160 gm. ham, boiled.
100 gm. roast veal.
100 gm. beefsteak.
100 gm. beefsteak pulp.
100 gm. roast beef.

Two to three hours:
250 gm. calf's brain boiled.
250 gm. sweetbread boiled.

Four to five hours:
210 gm. roast pigeon.
250 gm. roast fillet.
250 gm. beefsteak grilled.
250 gm. smoked tongue.
250 gm. hare.
240 gm. roast partridg
250 gm. roast goose.
280 gm. roast duck.

Beef.—The composition of beef varies greatly, especially in regard to the amount of fat and water it contains. An ox from three to five years old supplies the best beef. The meat of a very lean animal will contain about 75 per cent. of water and about 2 per cent. of fat. The water in fat meat is reduced to between 50 and 55 per cent., while the fat reaches 2.5 per cent. or over. The amount of nitrogenous substances is also considerably reduced in fat meat. Beef-fat is composed of the glycerids of the fatty acids, the ratio being three parts of stearic and palmitic acids to one part of oleic acid.

Meat Preparations.—Numerous meat preparations, both solid and liquid, are now on the market, the aim being to produce a concentrated food that will be readily digested. The different beef-juices have but slight nutritive value, most of them containing only 4 or 5 per cent. of protein; their chief value lies in the fact that they stimulate the appetite.

Bouillons.—Bouillons are prepared by cutting meat into small bits, heating slowly in water for a time, and then boiling it quickly. The fluid thus produced has a very agreeable flavor, but its nutrient value is exceedingly small, as it contains only extractives, salts, and a very minute quantity of gelatin. Bouillons increase the flow of the digestive secretions, and can be rendered more nutritious by the addition of an egg, certain cereals, or vegetables.

Beef-extracts.—Beef-extracts are concentrated bouillons that are to be diluted at the time they are taken. Their nutritive value is about the same as that of bouillon.

Bouillon Cubes.—These are widely sold and many people have an erroneous idea of their food value. They consist very largely of salt, varying from 49 to 72 per cent. and from 3 to 30 per cent. of vegetable extracts and from 8 to 28 per cent. of meat extract. They possess but little nutritive value, but stimulate the appetite. They should be avoided by persons with diseased kidneys.

Beef-juice.—To produce a nutritious liquid beef preparation the meat should be boiled slightly and then cut into small pieces and pressed through a lemon-squeezer or a meat-press. In this way considerable quantities of protein, in addition to the salts and extractives, are obtained. The beef-juices sold on the market, such as Valentine's, are prepared by subjecting the meat to strong pressure. These preparations contain from 5 to 10 per cent. of protein.

Meat Powders.—The nutritive value of these preparations varies greatly. Those most frequently used are a number of peptones, Somatose, and the Mosquera "Beef Meal."

Gelatin.—This should be nearly colorless, transparent, and amorphous. Mixed with cold water it swells to many times its normal volume; this melts at 35° C. One per cent. or more in solution will form a firm jelly if allowed to cool at about 10° C., but this dissolves on heating to 35° C. It has a food value of about 120 calories per ounce or 4.3 calories per gram. Gelatin has been described as a protective colloid, as it prevents certain colloids from precipitating in the presence of acids or salts, as in the digestive juices. It is easy to digest, readily absorbable, and rich in the growth stimulating amino-acid lysin, but it lacks tryptophan, and so there is no decomposition in the intestine into skatol or indol or its compounds. Tyrosin and cystin are also absent.

The following figures (representing percentages) have been obtained for the composition of gelatin (compiled by Downey from various sources):

Glycocoll	16.5	Glutaminic acid	0.88
Alanin	0.8	Aspartic acid	0.56
Aminovaleric acid	1.0	Serin	0.4
Leucin	2.1	Lysin	2.75
Prolin	5.2	Arginin	7.62
Phenylalanin	0.4	Histidin	0.40

Jacobi, in 1879, suggested the use of gelatin in infant feeding, and until recently it has not been very extensively used. (See Gelatin in Infant Feeding.) It is of great value as an additional food in malnutrition and lack of growth, particularly when this is associated with putrefaction in the intestine. In celiac disease it is of great value. In chronic intestinal indigestion and in certain forms of diarrhea it is of benefit not only as food, but in lessening the intestinal disturbance. It is of use in gastric hemorrhage. It is also used in diets for the diabetic. In building up patients after operations and after fevers gelatin is of great value, partly on account of its palatability and the ease with which it can be administered, and also to aid in taking unpalatable foods as well as raw eggs and milk. Suggestions for its use will be found under Gelatin.

Meat-jellies.—Meat-jellies are frequently given to invalids, and are an agreeable means of administering protein food. Although they do not entirely replace the protein in the tissues they produce a considerable quantity of energy. According to Bauer, "By the addition of gelatin very large quantities of albumin can be spared in the body or devoted to increase of bulk, just as by the supply of fats and carbohydrates." Meat-jelly is, therefore, a protein-sparer. Among those most commonly employed are calf's-foot and calf's-head jelly.

The following table, taken from Chittenden,[1] gives the percentage composition of beef-products:

Percentage Composition of Beef-products (Analyzed, 1891).

Constituents.	Liebig's extract of beef.	Armour's extract of beef.	Valentine's meat-juice.	Wyeth's beef-juice.	Bovinine.	Murdock's liquid food.	Johnston's fluid beef.	Arlington Chem. Co.'s beef peptonoids.	Mosquera "Beef Meal."
Water (at 110° C.)	20.06	14.03	60.31	57.88	81.09	83.89	39.58	6.80	6.68
Solid matter (at 110° C.) . . .	79 94	85.97	39.69	42.12	18.91	16.01	60.42	93.20	93.32
Soluble in water	79.94	85.97	39.69	42.12	18.91	16.01	50.40	48.12	31.26
Insoluble in water	. .	. .	. .	. .	. .	. .	10.02	45.06	62.06
Inorganic constituents . . .	24.04	28.29	11.30	17.52	1.02	0.66	13.52	5.08	4.23
Phosphoric acid (P_2O_5) . . .	9.13	7.28	4.00	3.94	0.03	0.09	3.91	1.40	1.71
Fat, ether extractives	0.91	1.27	0.78	0.85	1.49	0.27	1.29	2.95	13.60
Soluble in 80 per ct. alcohol	55.72	67.92	29.15	35.08	1.49	0.27	34.10	2.95	13.60
Total nitrogen	9.52	8.80	2.68	3.25	2.43	2.29	7.38	4.42	12.36
Nitrogen of insoluble matter	9.52	8.80	2.68	3.25	2.43	2.29	1.46	3.25	7.65
Insoluble proteid matter . .	9.52	8.80	2.68	3.25	2.43	2.29	9.12	20.30	47.81
Soluble albumin (coagulative by heat)	0.06	0.68	0.55	0.47	13.98	14.29			
Soluble albumoses	. .	. .	. .	. .	. .	. .	. .	5.44	11.09
Peptone	. .	. .	. .	. .	. .	. .	. .	1.87	18.34
Total proteid matter available as nutriment	0.06	0.68	0.55	0.47	13.98	14.29	9.12	27.61	77.24
Nutritive value as compared with fresh lean beef (lean beef, 100)	0.30	3.15	2.80	2.40	72.40	74.00	47.20	143.00	400.00

[1] Proceedings of Philadelphia County Medical Society, 1891, p. 150.

An examination into the chemic composition of beef preparations has been made by Dr. E. L. Whitney.

Total solids.	Bovinine.	Armour's soluble beef.	S. & D. tonic beef.	Parke, Davis & Co. nutritive liquid peptone.	Mulford's predi-gested beef.	Armour's wine of beef peptone.	Pano-pepton.	Hema-peptone.	Valentine's beef-juice.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Total solids	17.230	77.0500	17.4600	17.1700	8.6690	28.4000	16.9300	21.8200	45.7080
Ash	1.584	12.8500	1.5100	0.7870	0.2000	0.1100	1.1950	0.4850	10.9400
Alcohol	8.000	Absent	16.0000	26.0000	21.5800	22.7000	20.0000	9.5000	Trace
Nitrogen of coagulable protein	1.869								
Nitrogen of primary albumoses	Trace	Trace	Trace	Trace	Trace	Trace	0.2758	0.1796	0.0851
Nitrogen of secondary albumoses	Trace	2.6340	0.1093	0.0425	0.0851	0.0358	0.2394	0.1340	0.1848
Nitrogen of peptone and bases	. . .	4.5020	0.4345	0.1091	0.4443	0.1098	0.1932	0.4760	0.6023
Nitrogen of phosphotungstic acid filtrate	0.268	1.1550	0.2150	0.2258	0.1383	Trace	0.3066	0.1333	1.9184
Total nitrogen	2.137	9.3010	0.7588	0.3775	0.6677	0.1456	1.0150	1.2936	3.5959
Water	. . .	22.9500							
Nitrogen of globin	. . .	0.9847	. . .	. . .	. . .	. . .	. . .	0.3707	0.0101
Nitrogen of amido-acids	. . .	. . .	. . .	. . .	. . .	. . .	0.2226		
Loosely combined nitrogen of phosphotungstic acid filtrate	. . .	. . .	. . .	. . .	. . .	. . .	0.0840		
Sugar	Absent	. . .	Present	Present	Present	Present	Present	Absent	

Veal.—Veal is tough and indigestible, especially when obtained from animals that are killed too young. It differs considerably in flavor from beef, and contains more gelatin than the latter. As in many persons veal has a tendency to produce indigestion, it is to be avoided in all cases of digestive debility.

Mutton.—Mutton is considered more digestible than beef by English writers, probably because in England the average mutton is more tender than that obtained in the United States; the beef, however, is inferior to that raised in this country. Its fiber is finer, but it contains more fat than does beef. Mutton fat contains a larger proportion of glycerids of stearic acid, which makes it more solid and less digestible than the fat of beef.

Lamb.—Lamb, when of the right age and tenderness, is as digestible as beef or mutton, but it contains entirely too much fat.

Venison.—Unless obtained from young animals, when it is tender, highly flavored, and short-fibered, venison is apt to be difficult of digestion. On account of its stimulating action it should be avoided by dyspeptics and others with weak stomachs.

Pork.—Pork is the most indigestible of all meats on account of the large percentage of fat that it contains. This fat consists chiefly of the glycerids of palmitic and oleic acids, and may be present in the proportion of 37 per cent. or more.

Ham and Bacon.—Ham and bacon are both more digestible than pork. In some parts of Germany ham plays quite an important part in invalid dietaries, but in England and America it is seldom prescribed. Bacon is used largely as an army ration. When cooked crisp, thin slices of bacon are easily digested.

Horse Meat.—Horse meat is not used for food in the United States or in England, but is consumed in large quantities in France and Germany, and to a less extent in some other European countries.

Rabbit.—When young, rabbit meat is quite digestible, but it is usually omitted from diet-lists.

Fowl.—Chicken is one of the most digestible and agreeable varieties of meats. The meat of young pigeons also is especially digestible; that of ducks and geese contains too much fat.

The flesh of **game** is easily digested, the meat of the breast being best adapted for invalid use.

The table on page 130, taken from Atwater,[1] gives the general composition of the various meats:

[1] Principles of Nutrition, United States Department of Agriculture, p. 16.

Food-materials (as purchased).	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel-value per pound.
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Calories.
Beef, fresh:							
Chuck ribs	16.3	52.6	15.5	15.0	. .	0.8	910
Flank	10.2	54.0	17.0	19.0	. .	0.7	1105
Loin	13.3	52.5	16.1	17.5	. .	0.9	1025
Porterhouse steak	12.7	52.4	19.1	17.9	. .	0.8	1100
Sirloin steak	12.8	54.0	16.5	16.1	. .	0.9	975
Neck	27.6	45.9	14.5	11.9	. .	0.7	1165
Ribs	20.8	43.8	13.9	21.2	. .	0.7	1135
Rib rolls	. .	63.9	19.3	16.7	. .	0.9	1055
Round	7.2	60.7	19.0	12.8	. .	1.0	890
Rump	20.7	45.0	13.8	20.2	. .	0.7	1090
Shank, fore	36.9	42.9	12.8	7.3	. .	0.6	545
Shoulder and clod	16.4	56.8	16.4	9.8	. .	0.9	715
Forequarter	18.7	49.1	14.5	17.5	. .	0.7	995
Hindquarter	15.7	50.4	15.4	18.3	. .	0.7	1045
Beef, corned, canned, pickled, and dried:							
Corned beef	8.4	49.2	14.3	23.8	. .	4.6	1245
Tongue, pickled	6.0	58.9	11.9	19.2	. .	4.3	1010
Dried, salted, and smoked	4.7	53.7	26.4	6.9	. .	8.9	790
Canned boiled beef	. .	51.8	25.5	22.5	. .	1.3	1410
Canned corned beef	. .	51.8	26.3	18.7	. .	4.0	1270
Veal:							
Breast	21.3	52.0	15 4	11.0	. .	0.8	745
Leg	14.2	60.1	15.5	7.9	. .	0.9	625
Leg cutlets	3.4	68.3	20.1	7.5	. .	1.0	695
Forequarter	24.5	54.2	15.1	6.0	. .	0.7	535
Hindquarter	20.7	56.2	16.2	6 6	. .	0.8	580
Mutton:							
Flank	9.9	39.0	13.8	36.9	. .	0.6	1770
Leg, hind	18.4	51.2	15.1	14.7	. .	0.8	890
Loin chops	16.0	42.0	13.5	28.3	. .	0.7	1415
Forequarter	21.2	41.6	12.3	24.5	. .	0.7	1235
Hindquarter, without tallow	17.2	45.4	13.8	23.2	. .	0.7	1210
Lamb:							
Breast	19.1	45.5	15.4	19.1	. .	0.8	1075
Leg, hind	17.4	52.9	15.9	13.6	. .	0.9	860
Pork, fresh:							
Ham	10.7	48.0	13.5	25.9	. .	0.8	1320
Loin chops	19.7	41.8	13.4	24.2	. .	0.8	1245
Shoulder	12.4	44.9	12.0	29.8	. .	0.7	1450
Tenderloin	. .	66.5	18.9	13.0	. .	1.0	895
Pork, salted, cured, and pickled:							
Ham, smoked	13.6	34 8	14.2	33.4	. .	4.2	1635
Shoulder, smoked	18.2	36.8	13.0	26.6	. .	5.5	1335
Salt pork	. .	7.9	1.9	86.2	. .	3.9	3555
Bacon, smoked	7.7	17.4	9.1	62.2	. .	4.1	2715
Sausage:							
Bologna	3.3	55.2	18.2	19.7	. .	3.8	1155
Pork	. .	39.8	13.0	44.2	1.1	2.2	2075
Frankfort	. .	57.2	19.6	18.6	1.1	3.4	1155
Soups:							
Celery, cream of	. .	88.6	2.1	2.8	5.0	1.5	235
Beef	. .	92.9	4.4	0.4	1.1	1.2	120
Meat stew	. .	84.5	4.6	4.3	5.5	1.1	365
Tomato	. .	90.0	1.8	1.1	5.6	1.5	185
Poultry:							
Chicken, broilers	41.6	43.7	12.8	1.4	. .	0.7	305
Fowls	25.9	47.1	13.7	12.3	. .	0.7	765
Goose	17.6	38.5	13.4	29.8	. .	0.7	1475
Turkey	22.7	42.4	16.1	18.4	. .	0.8	1060

Animal Viscera.—Animal viscera are not so nutritious, although some of them are quite as digestible as most meats. Tripe, liver, kidney, and brains are eaten very extensively. The heart is tough, indigestible, and but seldom eaten. The blood of the pig has been made into a form of pudding and is relished by some. Sweetbreads—either the pancreas or the thymus gland of the calf—are easily digested. See also Purin Nitrogen.

The following table, compiled by Hutchison,[1] gives the general composition of animal viscera:

Composition of Animal Viscera.

	Water.	Nitrogenous mattter.	Fat.	Carbohydrates.	Ash.
Kidney (ox)	76.7	16.9	4.8	0.4	1.20
Kidney (sheep)	78.7	16.8	3.2	. .	1.30
Liver (ox)	71.2	20.7	4.5	1.5	1.60
Liver (sheep)	61.2	23.1	9.0	5.0	1.70
Heart (ox)	62.6	16.0	20.4	. .	1.00
Heart (sheep)	69.5	17.0	12.6	. .	0.90
Lung (ox)	79.7	16.1	3.2	. .	1.00
Lung (sheep)	75.9	20.2	2.8	. .	1.20
Sweetbreads	70.9	16.8	12.1	. .	1.60
Blood	80.8	18.1	0.2	. .	0.85
Tripe	74.6	16.4	18.5	. .	0.50
Tongue (ox), fresh	63.8	17.1	18.1	. .	1.00
Tongue, smoked and salted	35.7	24.3	31.6	. .	8.50
Brain	80.6	8.8	9.3	. .	1.10

FISH

The different kinds of fish vary widely in their nutritive and digestive qualities. For example, the flounder and the oyster are much easier of digestion than those that contain a large amount of fat, like the salmon and the herring. Eels contain the greatest proportion of fat, which may reach 28 per cent. White-fleshed fish, as a rule, contain little fat.

All fish are best in season; out of season they lose flavor and have a diminished nutritive value, and in some cases develop an offensive odor. These changes are due chiefly to the change in food. Fish are in best condition just before spawning; after this process they become thin and unfit for foot. The flavor of some varieties, such as the ray and the turbot, is improved by keeping.

On account of the rapid changes they undergo by way of decomposition, fish should always be eaten in as fresh a condition as possible. Various methods have been resorted to with a view to preventing these changes. There are many modern contrivances for preserving fish, and drying, smoking, pickling, salting, and canning are practised on a large scale. These methods all modify the flavor more or less.

There are several varieties of fish that are poisonous. These are, however, confined chiefly to tropical waters. The parasites that may be present in fish are destroyed during the cooking. Ptomain-poisoning is of rather rare occurrence. The table on pages 132, 133, taken from Langworthy,[2] gives the composition of the fish most commonly eaten:

[1] Food and Principles of Dietetics, p. 79.

[2] "Fish as Food," Farmers' Bulletin No. 85, United States Department of Agriculture, 1898, p. 12.

Composition of Fish.

Kind of food-material.	Refuse (bone, skin, etc.).	Salt.	Water.	Protein.	Fat.	Carbo-hydrates.	Mineral matter.	Total nutrients.	Fuel-value per pound.
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Calories.
Fresh fish.									
Alewife, whole	49.5	. .	37.5	9.7	2.5	. .	0.8	13.0	285
Bass, large-mouthed black, dressed	46.7	. .	41.9	10.3	0.5	. .	0.6	11.4	215
Bass, large-mouthed black, whole	56.0	. .	34.6	8.5	0.4	. .	0.5	9.4	175
Bass, small-mouthed black, dressed	46.4	. .	40.1	11.5	1.3	. .	0.7	13.5	270
Bass, small-mouthed black, whole	53.6	. .	34.7	10.0	1.1	. .	0.6	11.7	230
Bass, sea, dressed	46.8	. .	42.2	10.1	0.2	. .	0.7	11.0	195
Bass, sea, whole	56.1	. .	34.8	8.3	0.2	. .	0.6	9.1	160
Bass, striped, dressed	51.2	. .	37.4	8.7	2.2	. .	0.5	11.4	255
Blackfish, dressed	55.7	. .	35.0	8.3	0.5	. .	0.5	9.3	175
Bluefish, dressed	48.6	. .	40.3	9.8	0.6	. .	0.7	11.1	205
Butterfish, dressed	34.6	. .	45.8	11.7	7.2	. .	0.7	19.6	520
Butterfish, whole	42.8	. .	40.1	10.2	6.3	. .	0.6	17.1	455
Carp (European analysis)	37.1	. .	48.4	12.9	0.7	. .	0.9	14.5	270
Cod, dressed	29.9	. .	58.5	10.6	0.2	. .	0.8	11.6	205
Cod, steaks	9.2	. .	72.4	16.9	0.5	. .	1.0	18.4	335
Cusk, dressed	40.3	. .	49.0	10.1	0.1	. .	0.5	10.7	190
Eel, salt-water, dressed	20.2	. .	57.2	14.6	7.2	. .	0.8	22.6	575
Flounder, common, dressed	57.0	. .	35.8	6.3	0.3	. .	0.6	7.2	130
Flounder, winter, dressed	56.2	. .	37.0	6.1	0.2	. .	0.5	6.8	120
Hake, dressed	52.5	. .	39.5	7.2	0.3	. .	0.5	8.0	145
Haddock, dressed	51.0	. .	40.0	8.2	0.2	. .	0.6	9.0	160
Halibut, dressed	17.7	. .	61.9	15.1	4.4	. .	0.9	20.4	465
Herring, whole	46.0	. .	37.3	10.0	5.9	. .	0.8	16.7	435
Mackerel, dressed	40.7	. .	43.7	11.4	3.5	. .	0.7	15.6	360
Mackerel, Spanish, dressed	24.4	. .	51.4	15.8	7.2	. .	1.2	24.2	595
Mackerel, Spanish, whole	34.6	. .	44.5	13.7	6.2	. .	1.0	20.9	515
Mullet, dressed	49.0	. .	38.2	9.8	2.4	. .	0.6	12.8	285
Mullet, whole	57.9	. .	31.5	8.1	2.0	. .	0.5	10.6	235
Perch, white, dressed	54.6	. .	34.4	8.7	1.8	. .	0.5	11.0	235
Perch, white, whole	62.5		28.4	7.2	1.5	. .	0.4	9.1	195
Perch, yellow, dressed	35.1	. .	50.7	12.6	0.7	. .	0.9	14.2	265
Pickerel, dressed	35.9	. .	51.1	11.9	0.2	. .	0.9	13.0	230
Pickerel, whole	47.1	. .	42.2	9.8	0.2	. .	0.7	10.7	190
Pike, dressed	30.5	. .	55.4	13.0	0.4	. .	0.7	14.1	260
Pike, whole	42.5	. .	45.7	10.7	0.3	. .	0.6	11.6	210
Pollock, dressed	28.7	. .	54.3	15.5	0.6	. .	1.1	17.2	315

Table continued on page 128

Crustaceans.—The most popular of the crustaceans are the crab and the lobster. They are highly nutritious, but at the same time highly indigestible. In some persons the crab and the lobster are especially apt to bring on nausea, vomiting, and other and more distressing conditions.

Shellfish.—Oysters, clams, and mussels are the forms of shellfish chiefly eaten. Oysters, when eaten fresh and raw, constitute the most digestible animal food, but when cooked, their digestive value is much lowered. The soft part is proportionately larger and more nutritious than the corresponding portion of the clam. The hard or muscular portion is tough and rather indigestible, and is best omitted from invalid dietaries. Oysters should never be fried for the sick. It may be well here to call attention to the practice of ''fattening'' oysters for the market; this is done by placing them in either fresh or salt water for a definite length of time, which gives them a fresh and plump appearance. If the water used for this purpose contains sew-

Composition of Fish (Continued).

Kind of food-material.	Refuse (bone, skin, etc.).	Salt.	Water.	Protein.	Fat.	Carbo-hydrates.	Mineral matter.	Total nutrients.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Fresh fish.									
Pompano, dressed	45.5	. .	39.5	10.2	4.3	. .	0.5	15.0	370
Porgy, dressed	53.7	. .	34.6	8.6	2.4	. .	0.7	11.7	260
Porgy, whole	60.0	. .	29.9	7.4	2.1	. .	0.6	10.1	225
Red grouper, dressed	55.9	. .	35.0	8.4	0.2	. .	0.5	9.1	165
Red snapper, dressed	48.9	. .	40.3	9.6	0.6	. .	0.6	10.8	205
Salmon, California (sections)	5.2	. .	60.3	16.5	17.0	. .	1.0	34.5	1025
Salmon, Maine, dressed	23.8	. .	51.2	14.6	9.5	. .	0.9	25.0	675
Shad, dressed	43.9	. .	39.6	10.3	5.4	. .	0.8	16.5	420
Shad, whole	50.1	. .	35.2	9.2	4.8	. .	0.7	14.7	375
Shad, roe	. .	. .	71.2	23.4	3.8	. .	1.6	28.8	595
Smelt, whole	41.9	. .	46.1	10.0	1.0	. .	1.0	12.0	230
Sturgeon, dressed	14.4	. .	67.4	15.4	1.6	. .	1.2	18.2	355
Tomcod, dressed	51.4	. .	39.6	8.2	0.3	. .	0.5	9.0	165
Tomcod, whole	59.9	. .	32.7	6.8	0.2	. .	0.4	7.4	135
Trout, brook, dressed	37.9	. .	48.4	11.7	1.3	. .	0.7	13.7	275
Trout, brook, whole	48.1	. .	40.4	9.8	1.1	. .	0.6	11.5	230
Trout, lake, dressed	35.2	. .	45.0	12.4	6.6	. .	0.8	19.8	510
Turbot, dressed	39.5	. .	43.1	7.9	8.7	. .	0.8	17.4	515
Turbot, whole	47.7	. .	37.3	6.8	7.5	. .	0.7	15.0	440
Weakfish, dressed	41.7	. .	46.1	10.2	1.3	. .	0.7	12.2	245
Weakfish, whole	51.9	. .	38.0	8.4	1.1	. .	0.6	10.1	200
Whitefish, dressed	43.6	. .	39.4	12.5	3.6	. .	0.9	17.0	385
Whitefish, whole	53.5	. .	32.5	10.3	3.0	. .	0.7	14.0	320
General average of fresh fish as sold	42.0	. .	44.0	10.5	2.5	. .	1.0	14.0	300
Preserved fish.									
Mackerel, "No. 1," salted	33.3	7.1	28.1	14.7	15.1	. .	1.7	31.5	910
Cod, salted and dried	24.9	17.2	40.3	16.0	0.4	. .	1.2	17.6	315
Cod, "boneless codfish," salted and dried	. .	21.5	54.4	22.1	0.3	. .	1.7	24.1	425
Caviare	. .	. .	38.1	30.0	19.7	7.6	4.6	60.9	1530
Herring, salted, smoked, and dried	44.4	6.5	19.2	20.2	8.8	. .	0.9	29.9	45
Haddock, "findon haddie," salted, smoked and dried	32.2	1.4	49.2	16.1	0.1	. .	1.0	17.2	305
Halibut, salted, smoked, and dried	6.9	12.1	46.0	19.1	14.0	. .	1.9	35.0	945
Sardines, canned	5.0	. .	53.6	24.0	12.1	. .	5.3	41.4	955
Salmon, canned	3.9	1.0	59.3	19.3	15.3	. .	1.2	35.8	1005
Mackerel, canned	. .	1.9	68.2	19.9	8.7	. .	1.3	29.9	735
Mackerel, salt, canned	19.7	8.3	34.8	13.8	21.3	. .	2.1	37.2	1155
Tunny (horse-mackerel), canned	. .	. .	72.7	21.5	4.1	. .	1.7	27.3	575
Haddock, smoked, canned	. .	5.6	68.7	21.8	2.3	. .	1.6	25.7	505

age, contamination is sure to follow. Oysters have in many cases been the carriers of typhoid fever, and many persons have been infected in this way.

Clams are a popular article of diet, and are as agreeable to most palates as oysters. Mussels are consumed chiefly by the poorer classes in the seaport towns of England.

Langworthy[1] gives the table, on the next page, of the average composition of mollusks, crustaceans, etc.:

[1] "Fish as Food," Farmers' Bulletin No. 85, United States Department of Agriculture, 1898, p. 13.

Composition of Mollusks, Crustaceans, etc.

Kind of food-material.	Refuse (bone, skin, etc.).	Salt	Water.	Protein.	Fat.	Carbohydrates.	Mineral matter.	Total nutrients.	Fuel-value per pound.
Mollusks.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Oysters, solid	. .	. .	88.3	6.1	1.4	3.3	0.9	11.7	235
Oysters, in shell	82.3	. .	15.4	1.1	0.2	0.6	0.4	2.3	40
Oysters, canned	. .	. .	85.3	7.4	2.1	3.9	1.3	14.7	300
Scallops	. .	. .	80.3	14.7	0.2	3.4	1.4	19.7	345
Long clams, in shell	43.6	. .	48.4	4.8	0.6	1.1	1.5	8.0	135
Long clams, canned	. .	. .	84.5	9.0	1.3	2.9	2.3	15.5	275
Round clams, removed from shell	. .	. .	80.8	10.6	1.1	5.1	2.3	19.2	340
Round clams, in shell	68.3	. .	27.3	2.1	0.1	1.3	0.9	4.4	65
Round clams, canned	. .	. .	83.0	10.4	0.8	3.0	2.8	17.0	285
Mussels	49.3	. .	42.7	4.4	0.5	2.1	1.0	8.0	140
General average of mollusks (exclusive of canned)	60.2	. .	34.0	3.2	0.4	1.3	0.9	5.8	100
Crustaceans.									
Lobster, in shell	62.1	. .	31.1	5.5	0.7	. .	0.6	6.8	130
Lobster, canned	. .	. .	77.8	18.1	1.1	0.6	2.4	22.2	395
Crawfish, in shell	87.7	. .	10.0	2.0	0.1	0.1	0.1	2.3	45
Crab, in shell	55.8	. .	34.1	7.3	0.9	0.5	1.4	10.1	185
Crab, canned	. .	. .	80.0	15.8	1.5	0.8	1.9	20.0	370
Shrimp, canned	. .	. .	70.8	25.4	1.0	0.2	2.6	29.2	520
General average of crustaceans (exclusive of canned)	73.7	. .	20.9	4.3	0.4	0.2	0.5	5.4	100
Terrapin, turtle, etc.									
Terrapin, in shell	79.0	. .	15.6	4.5	0.7	. .	0.2	5.4	115
Green turtle, in shell	76.0	. .	19.1	4.5	0.1	. .	0.3	4.9	90
Average of turtle and terrapin	77.5	.	17.4	4.2	0.7	. .	0.2	5.1	105
Frogs' legs	32.0	. .	57.0	10.2	0.1	. .	0.7	11.0	210
General average of fish, mollusks, crustaceans, etc.	44.0	. .	42.5	10.0	2.5	0.1	0.9	13.5	295

VEGETABLE FOODS

Vegetable foods differ from animal foods especially in that they contain a large proportion of starch and sugar and comparatively a small amount of protein. Yeo[1] gives the following table to show the difference between vegetable and animal foods in this regard:

	Nitrogenous constituents.	Fat.	Carbohydrates.	Salts.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Fat beef	51.4	45.6	. .	3.0
Lean beef	89.4	5.5	. .	5.1
Pea-flour	27.3	0.8	68.9	3.0
Wheat	16.6	0.9	81.9	0.6
Rice	7.7	0.4	91.2	0.7

Vegetables do, however, contain a certain amount of proteins and fats; some are rich in protein, others in fats.

Carbohydrates of Vegetables.—These are starches and sugars. Starch is found in all plants, and is converted into dextrin by means

[1] Food in Health and Disease, p. 66.

of dry heat or by cooking. The starch-granules in vegetables are held together by a cellulose framework. Cellulose is a carbohydrate, but is very insoluble; it can be utilized as a food only when young; when old, it is resistant and can not be digested, and hinders digestion of the starches enveloped by it. Besides the starch and cellulose, another form of carbohydrate, known as pectin, is present in some vegetable foods. When fruit is cooked, this pectin gelatinizes, and the jelly when digested is converted into a certain form of sugar. Sugars are also important carbohydrates found in vegetables.

Protein in Vegetables.—These proteins belong mainly to the globulins, but in addition vegetables contain a large number of nitrogenous substances that are not proteins. Among the various proteins in vegetables are gluten, as found especially in flour, legumen found in the legumes, and vegetable protein found in vegetable juices.

Extractives in Vegetables.—There is a considerable amount of extractive matter in certain vegetables, such as asparagus, which is not utilized in the body.

Fats in Vegetables.—The fats in vegetables are chiefly in the form of oils. In addition, vegetables contain a considerable amount of **water** and **salt.** The amount of water varies between 70 and 90 per cent. The main mineral constituents are the salts of potassium and sodium united with organic acids.

Digestibility of Vegetables.—The digestion of vegetables takes place mainly in the intestine. Owing to the greater bulk of vegetable food and to the cellulose that surrounds vegetable cells and thus prevents the ready access of the digestive juices, vegetable food is not so easily digested as animal food. (For an account of the absorbability of vegetable foods the reader is referred to the section on that subject.) For convenience of description the following classification of vegetable foods has been adopted:

1. Cereals.
2. Legumes.
3. Roots and tubers.
4. Green vegetables.
5. Fruits.
6. Nuts.
7. Fungi.
8. Lichens.

CEREALS

Cereals are the most important food-products derived from the vegetable kingdom. Of this class of foods those in commonest use are wheat, corn, rye, oats, barley, rice, and buckwheat. The cereals are eaten chiefly after having been ground into flour or meal. Flour is most commonly made from wheat and rye, whereas corn and oats are the chief sources of meal. Corn is also eaten in large quantities whole, and barley and rice are also eaten in this way. The table [1] on the next page gives the chemic composition of the most common cereals:

[1] United States Department of Agriculture, Office of Experiment Station, Bulletin No. 11, pp. 16 and 17, and Bulletin No. 28 (Revised Edition), p. 56.

	Water.	Protein.	Fat.	Carbohydrates. Starch, etc.	Carbohydrates. Crude fiber.	Ash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Barley	10.9	12.4	1.8	69.8	2.7	2.4
Buckwheat	12.6	10.0	2.2	64.5	8.7	2.0
Corn (maize)	9.3	9.9	2.8	74.9	1.4	1.5
Kafir corn	16.8	6.6	3.8	69.5	1.1	2.2
Oats	11.0	11 8	5.0	59.7	9.5	3.0
Rice	12.4	7.4	0.4	79.2	0.2	0.4
Rye	11.6	10.6	1.7	72.0	1.7	1.9
Wheat:						
Spring varieties . .	10.4	12.5	2.2	71.2	1.8	1.9
Winter varieties . .	10.5	11.8	2.1	72.0	1.8	1.8

Wheat is the most important source of flour, owing to the fact that it can be raised in any temperate climate and yields the best flour at the least expense. It is rich in solids and contains little water. The wheat-grain is covered by six layers, which form the bran. Of these six, the three outermost coats form the skin, and the remaining three layers the envelop of the grain. The outermost layer is called the testa; the innermost, or cereal layer, takes its name from the cerealin which it contains. Within the cerealin layer, and adjacent to the embryo, lies the endosperm, which contains the starch. The embryo lies at the lower end of the grain. The five outer layers are composed chiefly of cellulose. The cereal layer is the richest in nitrogenous substances. The endosperm contains a large amount of starch, a nitrogenous substance called gluten, some sugar, and the cellulose of its cell-wall.

Flour is made by grinding the grain of the various cereals. Although flour is made chiefly from wheat and rye; barley, oats, maize, etc., are also manufactured into flour.

Bread is made by adding to flour a definite proportion of water, a little salt, and the leavening agent. The mixture or dough is then kneaded, either with the hands or, better, with a spoon. In the large modern bakeries the kneading is done entirely by machinery. After this the dough is set aside for a number of hours, during which time fermentation takes place. It is then molded into loaves and baked. The leavening is dependent upon the action of the yeast on the starch, some of which it converts into sugar, and then into alcohol and carbon dioxid gas. The gas causes bubbles to appear throughout the dough, and renders it light and spongy. During the baking process the yeast germs are killed and the alcohol and carbonic acid gas are driven off. Hot or fresh bread, when masticated, forms a tenacious, doughy mass, and hence is not so digestible as stale bread, or bread that has been allowed to dry slightly, for the latter will crumble into fine particles and so is more thoroughly mixed with the gastric juice. Toasting bread makes it more digestible. A slice of bread remains in the stomach about two and one-half hours.

Next to wheat bread, which thus far has alone been mentioned, rye bread is the most important of the breadstuffs. While it is not so digestible for invalids as wheat bread, it is more laxative and keeps fresh longer than wheat bread. Wheat and rye flour are often mixed in bread-making.

Pumpernickel is a whole-rye bread made by the Germans. It is slightly laxative. Gluten bread is made from gluten flour, and is used chiefly by diabetics. The best bread contains from 40 to 50 per cent. of gluten. Biscuits, pastries, and puddings are made by adding to the flour varying quantities of eggs, sugar, milk, butter, fruit, flavoring extracts, etc.

Buckwheat flour is often made into batter-cakes in the United States, but in some parts of Russia buckwheat porridge forms the principal cereal food. Bread made from buckwheat crumbles and does not keep well.

Proso and Millet.—Nansen studied the possibility of millet as a food for human beings. In Russia, China, and India millet is used, especially in times of famine. The grain can be milled and cooked very much in the same way as other cereals and is rich in protein. It lacks gluten, however, and a certain amount of wheat flour is needed to produce a suitable bread. It has the advantage that it will grow in an extremely dry climate. (See Bulletin 525, United States Dept. of Agriculture.)

Maize or Indian Corn.—This forms an important part of the diet in many parts of the country. The different varieties have various colors, but the nutritive value is approximately the same and the choice is very largely a matter of taste and changes with the locality. The green corn boiled or roasted is, of course, popular in season and the dried corn from which the covering has been removed or hominy is another staple dish.

The composition and fuel value are given as follows by Langworthy and Hunt in the Farmers' Bulletin 565, United States Department of Agriculture:

Average composition of corn and corn-meal products.

Kind of material.	Water.	Protein.	Fat.	Carbohydrates.		Mineral matters.	Fuel value per pound.
				Starch, sugar, etc.	Crude fiber.		
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*
Corn, whole grain, average	10.8	10.0	4.3	71.7	1.7	1.5	1,795
Corn, white	11.4	10.8	5.0	68.8	2.5	1.5	1,690
Corn, yellow	11.9	10.7	4.8	68.9	2.2	1.5	1,690
Corn meal (whole grain ground, unbolted	12.0	8.7	4.7	71.1	2.2	1.3	1,850
Corn meal (whole grain ground), bolted	12.0	8.9	4.9	72.0	1.2	1.0	1,765
Corn meal, granulated (new process)	12.5	9.2	1.9	74.4	1.0	1.0	1,770
Corn flour, i. e., finely ground and bolted corn meal	12.6	7.1	1.3	77.5	.9	.6	1,645

The kernel consists of the skin, the germ and the endogerm, which acts as a storehouse for the nourishing of the germ when it starts to grow. The composition of the flours varies greatly according to the nature of the milling process. The old process left in much that is removed by the new process. Removing the skin takes away only six one-hundreths of the whole weight, but more than half the fiber. In modern milling the germ is removed which takes away only one-tenth of the weight, but more than six-tenths of the fat and one-sixth of the protein. The modern milling removes the vitamins. (See same and the Deficiency Diseases and Pellagra.)

Where corn is much used there is a natural tendency to balance the diet by using foods rich in protein, especially pork products. Corn is deficient in gluten and it is difficult to make bread that will hold together. Sometimes other flours are added or the outside is quickly browned so as to hold the small loaf together.

Sorghum is occasionally made into bread, but in America it is grown usually for the molasses and syrup that may be obtained from it.

Kaoliang.—This is a grain sorghum used in Africa and parts of Asia (U. S. Department of Agriculture, Bureau of Plant Industry, 1911, p. 203). This plant will grow in about the same climates as Indian corn and was introduced into America in 1866, but was discarded as a source of sugar. The grain of this plant can be milled and forms a suitable food and when mixed with gluten-containing flours makes bread suitable for human consumption.

Rice constitutes the staple food of many of the peoples of the Orient. It is grown chiefly in Asia, but is also raised in some parts of Europe. In the United States rice culture is confined chiefly to South Carolina. Rice contains a large proportion of starch in very digestible form, but it is comparatively poor in other constituents.

Barley bread was used for food by the early Greeks and Romans, who also used barley meal to a large extent in the training of their athletes. Since the introduction of potatoes as food, and with the cheapening of wheat flour, barley bread has gradually fallen into disuse. Barley-water is used as a beverage for invalids and infants.

Oats contain liberal proportions of fat, protein, and salts, a large amount of starch, and considerable indigestible cellulose.

Oatmeal is used to the best advantage in making porridge; owing to its lack of gluten it makes only the poorest kind of bread. What is known as Scotch groats is prepared by freeing the grain from its outer-husk. Oatmeal porridge is said to act as a mild laxative in some persons, and to excite dyspeptic symptoms in others.

Breakfast Foods.—There are a variety of preparations made from cereals which have been in recent years placed on the market, the chief characteristics of which are that they have undergone, more or

less, preparation for immediate consumption. For the most part they are sold under trade names; the composition and source of the food is given in some cases and omitted in others. Briefly speaking, they contain about the same amount of nutriment as the cereals from which they are made. Their palatability varies considerably and there is no objection to the use of such articles of diet if freshly prepared foods are obtained and the individual that consumes them likes the taste. The older packages, unless very carefully put up, are liable to be infected with insects or moulds, both of which render the product unfit for food. The chief objection is the cost, which is far greater than the same amount of food prepared from the cereal itself.

LEGUMES

Of the legumes, the pea and the bean are the most important food-products. In the middle and northern parts of Europe the pea is the most popular legume, while in the Mediterranean countries the bean predominates. In America peas and beans are extensively raised. The peanut is an American favorite, but the lentil is eaten only to a very small extent.

The legumes contain a liberal proportion of protein (legumin), carbohydrates, and a little fat, besides a large amount of water. Although legumes contain a proportion of protein in excess of that of meat, a large amount of fat, and considerable starch, they are less easily digested than animal foods. As pointed out by Abel,[1] this is due to three reasons:

"(1) As generally prepared and used, the nutrients of vegetable foods are inclosed in cells composed of cellulose or woody fiber, which is more or less hard and greatly interferes with their absorption.

"(2) Vegetable food is prone to fermentation in the intestine, thus increasing the peristaltic movements, and, if large amounts are eaten, hastening the food onward before there has been sufficient time for the absorption of its contained nutrients.

"(3) The cellulose present acts as a local irritant and produces the same effect."

Legumes are apt to produce fermentation, and in this way occasion flatulence and gastro-intestinal distress. The digestibility of the legumes depends largely upon the manner in which they are prepared and the amount that is eaten. Strümpell[2] has shown that about 40 per cent. of the contained protein in cooked beans is left unabsorbed, the beans being eaten with the skins; and that with a flour made from lentils only 8.2 per cent. of the original amount of protein is left unabsorbed; so that when eaten simply cooked, a much larger proportion remains unabsorbed than when finely divided into a powder.

[1] Farmers' Bulletin No. 121, United States Department of Agriculture, 1900, p. 18.

[2] Strümpell, Deutsch. Arch. f. klin. Med., vol. xvii., p. 108.

Beans form one of the oldest forms of vegetable foods, having been cultivated by the ancient Greeks, Romans, and Egyptians. The numerous varieties used for food have all been improved by cultural methods. The Windsor bean, the one which was first cultivated, is still grown in Europe, but does not thrive well in America. The kidney bean, the most important species, is easily cultivated, growing rapidly and seeding early. The Lima bean is a great favorite, especially in America. It is a short flat bean, somewhat like the kidney in shape. This variety is a climber, although bush Limas have been developed by cultural methods.

The Soy Bean.—This bean (*Glycine hispida*), sometimes called the soja bean, is an annual leguminous plant extensively used as a food in China and Japan. Until recently it has been regarded as a botanic curiosity in the Occident. It has recently been extensively used in America as a forage crop, and to improve the soil if ploughed under. The plant is an erect annual, bearing pods containing from two to five beans. There are a large number of different varieties, which vary in size, shape, color, and length of time they take to mature. In the East the bean is used in numerous ways. Some are grown exclusively for the oil they contain, and it is used for culinary, illuminating, and lubricating purposes. The light-colored beans are eaten in soups, and the pods are sometimes picked green, boiled, and served cold with a sprinkling of soy sauce. The green varieties are often pickled in brine and eaten moist or dried with meals as appetizers; the same varieties are often slightly sprouted, scalded, and served with meals in winter as a green vegetable. The bean forms the basis of the so-called soy sauces, used as condiments all over the world. The Oriental races most frequently eat the bean in more or less cheesy-like foods, which are prepared from it. The most common of these are natto, tofu, miso, yuba, and shoyu. Natto is a sort of bean cheese made by boiling the beans until they become soft and then placing the resulting mass in a warm cellar where it ferments. Tofu is made by soaking the beans in water, crushing between millstones, and boiling in about three times their bulk of water. The protein is precipitated and the resulting cheese eaten. The white milky liquid of the above has nearly the composition of cows' milk, and tastes something like malt. It may be used in infant feeding to advantage (see same).

Americans may eat the beans in numerous ways, described under the head of soy bean cookery in the recipes at the end of this book. The bean is of particular value in diabetes (see same). It may be used to increase the protein of the diet.

There are variations in the composition of the different varieties of beans. The yellow beans grown in America have the following composition:

Water	10.13	per cent.
Protein	34.63	"
Fat	17.98	"
Nitrogen-free extract	30.50	"
Fiber	3.69	"
Ash	3.07	"

Calculated to a water-free basis:

Protein	38.50	per cent.
Fat	20	"

The Cereo Company, Tappan, N. Y., have made a soy bean flour which is most useful. It has the following composition:

Protein N. X. 6.25	44.64	per cent.
Fat	19.43	"
Mineral matter	4.20	"
Moisture	5.26	"
Crude fiber	2.35	"
Cane-sugar	9.34	"
Non-nitrogenous extract	14.78	"
Starch	None.	
Reducing sugars	None.	
Polarization normal weight due to optically active substance other than cane-sugar included in protein and non-nitrogenous extract	7.80	"

The percentage of protein in this flour is almost one-third greater than the percentage of protein in the whole beans. This is caused by removing the coarse fibrous hulls which contain little protein.

Vegetable food of such composition certainly is remarkable when compared with round of beef, medium, which contains:

Protein	19.0	per cent.
Fat	12.8	"
Moisture	60.7	"

Each ounce of this soy gruel flour yields about 13 grams of protein and 120 calories, and there are several ways in which it can be used: 1, As a gruel; 2, in broths; 3, in making biscuits. For composition of soy gruels, see Infant Feeding.

The bean has received attention from time to time in other countries, and suggestion comes in the form of a patent flour made by a German firm, patented in this country. This is made by treating the beans with boiling water and 0.5 per cent. of sodium carbonate until the carbohydrates and other water-soluble substances are removed. The residue after being dried and pulverized is a yellow powder, containing the nutritive fatty and protein constituents of the beans. The following articles may also be consulted:

Ruhräh: "The Soy Bean as an Article of Diet for Infants," Journal of the American Medical Association, May 21, 1910, p. 1664.
Friedenwald and Ruhräh: "The Use of the Soy Bean as a Food in Diabetes," American Journal of Medical Sciences, December, 1910.
Ruhräh: "Further Observations on the Soy Bean," Archives of Pediatrics, October, 1911.
Ruhräh: "Soy Bean Cookery," Medical Record, September 23, 1911.

There are several varieties of **peas**, the most important being the field and the garden pea. The former is generally used for fodder; but one variety, the Canadian field pea, is grown for table use. There are many varieties of the garden pea. The shelling peas, the kind in most common use in America, and the sugar pea are the most important varieties.

The **lentil**, as has been stated, is but little used in the United States. The chief supply of lentils comes from Egypt, very few

Composition of Fresh and Dried Legumes compared with that of other Foods.—(Abel.[1])

Material.	Water.	Protein.	Fat.	Carbo-hydrates.	Ash.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Fresh legumes:						
String-beans	89.2	2.3	0.3	7.4	0.8	195
Whole pods of *Dolichos sesquipedalis*	71.9	4.5	0.5	13.9	1.2	365
Sugar peas or string-peas	81.8	3.4	0 4	13.7	0.7	335
Shelled kidney beans	58.9	9.4	0.6	29.1	2.0	740
Shelled Lima beans	68.5	7.1	0.7	22.0	1.7	570
Shelled peas	74.6	7.0	0.5	16.9	1.0	465
Shelled cowpeas	65.9	9.4	0.6	22.7	1.4	620
Canned string-beans	93.7	1.1	0.1	3.8	1.3	95
Canned Lima beans	79.5	4.0	0.3	14.6	1.6	360
Canned kidney beans	72.7	7.0	0.2	18.5	1.6	480
Canned peas	85.3	3.6	0.2	9.8	1.1	255
Canned baked beans	68.9	6.9	2.5	19.6	2.1	600
Peanut butter	2.1	29.3	46.5	17.1	5.0	2825
Dried legumes:						
Lima beans	10.4	18.1	1.5	65.9	4.1	1625
Navy beans	12.6	22.5	1.8	59.6	3.5	1605
Frijoles	7.5	21.9	1.3	65.1	4.2	1695
Lentils	8.4	25.7	1.0	59.2	5.7	1620
Dried peas	9.5	24.6	1.0	62.0	2.9	1655
Cowpeas	13.0	21.4	1.4	60.8	3.4	1590
Soy beans	10.8	34.0	16.8	33.7	4.7	1970
Chick-pea *a*	14.8	12.4	6.7	63.3	2.8	1690
Peanuts	9.2	25.8	38 6	24.4	2.0	2560
St. John's bread (carob bean) *a*	15.0	5.9	1.3	75.3	2.5	1565
Potatoes	78.3	2.2	0.1	18.4	1.0	385
Cabbage	91.5	1.6	0.3	5.6	1.0	145
Tomatoes	94.3	0.9	0.4	3.9	0.5	105
Rolled oats	7.7	16 7	7.3	66.2	2.1	1850
Wheat breakfast foods	9.6	12.1	1.8	75.2	1 3	1700
Spring-wheat flour	12.3	11.7	1.1	74.5	0.4	1650
Winter-wheat flour	11.9	10.7	1.0	75.8	0.6	1650
Lean beef	70.0	21.3	7.9	. .	1.1	730
Dried beef	54.3	30.0	6.5	0.4	9.1	840
Milk	87.0	3.3	4.4	5.0	0.7	325
Cheese	34.2	25.9	33.7	2.4	3.8	9150
Eggs	73.7	14.8	10.5	. .	1.0	720

a European analysis.

being grown in Europe. They form a highly nutritious food, but the flavor is disagreeable to many persons, and they are said to produce indigestion in some instances.

[1] Farmers' Bulletin No. 121, U. S. Department of Agriculture, p. 17.

The **peanut,** although peculiar in its growth, is a legume as well as the pea and bean. It differs chemically from the other legumes in that it contains a large amount of fat.

ROOTS AND TUBERS

Roots and tubers constitute another class of vegetable foods that are of great importance. They contain both starch and sugar, and to these constituents is due their chief value as a food. On account of the small proportion of protein and the large amount of water they contain, they are inferior in nutritive value to both legumes and cereals.

The **potato** is, for several reasons, the most important member of the group. It is a tuber or thickened underground stem of *Solanum tuberosum.* It grows equally well in a variety of soils, and when properly cooked is easily digested. When cooked in water, the salts pass into the water, but when cooked in their skins this loss is largely prevented. By baking or roasting the salts are best retained and the potato rendered most easily digestible.

The **sweet potato** contains more water and sugar but less starch than the white potato. When boiled, it usually becomes mealy, but is often converted into a stringy, sodden mass that is difficult of digestion.

The **yam** is a tuber somewhat resembling the potato. It is grown and eaten chiefly in the tropics, but also in some parts of Europe.

The Dasheen.—This is a plant of the Araceæ family, growing in the tropics and subtropics. The tubers and corms are used for food after the manner of the potato and sweet potato. The corms may be converted into flour and used in soups and gruels. The tubers contain more than 50 per cent. more protein and carbohydrate than the potato and are easily digestible.

Average composition of edible portion of dasheen and other tropical tarch-bearing roots.

Kind of food.	Water.	Protein.	Fat.	Total carbohydrates.		Ash.	Fuel value per pound.
				Sugar, starch, etc.	Crude fiber.		
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Sweet cassava	66.0	1.1	0.2	30.2	1.8	0.7	610
Cassava starch	10.5	.5	.1	88.8		.1	1,625
Cassava bread	10.5	9.1	.3	79.0		1.1	1,610
Cassava cakes or wafers .	10.3	1.1	.2	85.2	1.6	1.6	1,605
Yams	72.9	1.8	.2	23.3	.6	.9	475
Dasheen	65.7	3.0	.2	28.8	.7	1.3	605
Taro	70.9	1.8	.2	23.2	.8	1.2	475
Yautia	70.0	2.2	.2	26.1	.6	.9	530
Potatoes for comparison ..	78.3	2.2	.1	18.0	.4	1.0	380
Sweet potatoes for comparison	69.0	1.8	.7	26.1	1.3	1.1	560

The **Jerusalem artichoke** is commonly used in England. It is sweet and watery, contains little starch, is only slightly nutritive, but quite easily digestible.

The **beet** contains a very large percentage of starch and sugar. It is raised extensively for the sugar industry, and is also largely employed for making salads to lend variety to the diet.

Carrots, when young and tender, form a very nutritious food, and are greatly relished by many persons. They contain from 85 to 90 per cent. of water.

Parsnips when boiled long enough form a good food; like carrots, they contain a large proportion of water and a considerable amount of sugar.

Turnips have very slight nutritive value, but are, nevertheless, very popular as a vegetable. They have a tendency to cause flatulence.

Radishes are used chiefly to give a relish to the food. They contain little starch and a large percentage of water.

The following table, taken from Atwater,[1] gives the average composition of the common roots and tubers:

Food-materials.	Refuse.	Water.	Protein.	Fat.	Carbo-hydrates.	Ash.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Potatoes	20	62.6	1.8	0.1	14.7	0.8	295
Sweet potatoes	20	55.2	1.4	0.6	21.9	0.9	440
Beets	20	70.0	1.3	0.1	7.7	0.9	160
Parsnips	20	66.4	1.3	0.4	10.8	1.1	230
Turnips	30	62.7	0.9	0.1	5.7	0.6	120

GREEN VEGETABLES

The green vegetables are valuable not only on account of the amount of nutriment present in them, but for the variety and relish they give to the diet. They contain a large amount of salts and have valuable antiscorbutic properties.

Bryant and Milner, in a very careful series of experiments,[2] have arrived at the following conclusions concerning the digestibility of certain vegetables:

"So far as sources of protein or fat are concerned, the vegetables (potatoes, cabbage, and beets) included in these studies may be considered as of little value. They do, however, contain carbohydrates which are well digested and absorbed; and they may therefore be considered as of value as sources of energy, a large proportion of which appears to be available to the body. The chief value of many

1 "Principles of Nutrition and Nutritive Value of Foods," Farmers' Bulletin, No. 142, 1902, p. 17.

2 American Journal of Physiology, 1903, vol. x., No. 2, p. 81.

vegetables, however, is, perhaps, aside from the nutriment or energy they furnish; they add a pleasing variety and palatability to the diet, supply organic acids and mineral salts, and give the food a bulkiness that seems to be of importance in its mechanical action in maintaining a healthy activity of the alimentary tract. Possibly the result of these conditions is a favorable influence upon the digestion of other food eaten with the vegetable."

Cabbages contain a considerable quantity of sulphur, and on this account are apt to cause flatulence; where digestion is good, however, they are considered a wholesome form of food. *Sauerkraut* is cabbage prepared by placing salt between layers of shredded cabbage leaves and then subjecting the mass to pressure. This presses out the juice, after which acid fermentation sets in. Owing to the fermentation it produces sauerkraut is considered indigestible.

Cauliflower is the most digestible member of the cabbage family. It may be eaten either as a salad or boiled and served with a milk-sauce.

Spinach is a popular form of vegetable and is used to a great extent. It is valuable chiefly for its laxative effect.

New Zealand Spinach.—Tetragonia expansa is not a spinach, but is grown to replace ordinary spinach during the hot summer months, or in dry arid localities where ordinary spinach does badly.

Lettuce is the most important representative of a group of vegetables usually eaten raw. It is made into salad and dressed with vinegar. The various cresses also belong to this class.

Sorrel is eaten chiefly in Europe. It has a peculiar acid taste, due to acid oxalates, on account of the presence of which it is to be avoided by those subject to gout or rheumatism.

Celery, which is usually eaten raw, is stringy and has scarcely any nutritive value. Cooked in milk it forms a wholesome and digestible article of food.

Tomatoes are eaten both raw and cooked, and are refreshing, generally liked, and easily digested. They are used to flavor broths and are valuable for canning purposes, inasmuch as they retain their flavor better than most vegetables.

The **eggplant,** a close relative of the tomato, is less digestible, especially when fried, than the latter.

Cucumbers are eaten raw, and when young are often pickled in vinegar. They are very indigestible.

Asparagus is highly esteemed for its delicate flavor. It is easily digested, even by invalids. It has a slightly diuretic action, and imparts a most offensive odor to the urine, which persists for from twelve to twenty-four hours.

Rhubarb, when thoroughly cooked, is quite digestible and acts as a laxative.

Pumpkins are used largely in the making of pies, etc., but they have no special food-value.

Squash, when young, is quite digestible.

Onions, garlic, etc., are used both as vegetables and as condiments. While onions are used largely for flavoring meat-stews, salads, and the like, they are also eaten for their mildly laxative properties.

The following table, taken from Hutchison (p. 239), gives the composition of the various vegetables:

	Water.	Nitrogenous matter.	Fat.	Carbohydrates.	Mineral matter.	Cellulose.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Cabbage	89.6	1.80	0.40	5.8	1.30	1.10	165
Cabbage, cooked	97.4	0.60	0.10	0.4	0.13	1.30	165
Cauliflower	90.7	2.20	0.40	4.7	0.80	1.20	175
Sea-kale	93.3	1.40	0.40	3.8	0.60	0.90	175
Sea-kale, cooked	97.9	0.40	0.07	0.3	0.20	1.10	175
Spinach	90.6	2.50	0.50	3.8	1.70	0.90	120
Vegetable marrow	94.8	0.06	0.20	2.6	0.50	1.30	120
Vegetable marrow, cooked	99.2	0.09	0.04	0.2	0.05	0.37	120
Brussels sprouts	93.7	1.50	0.10	3.4	1.30	0.37	95
Tomatoes	91.9	1.30	0.20	5.0	0.70	1.10	105
Tomatoes, cooked	94.0	1.00	0.20	0.1	0.70	1.50	105
Greens	82.9	3.80	0.90	8.9	3.50	1.50	275
Lettuce	94.1	1.40	0.40	2.6	1.00	0.50	105
Lettuce, cooked	97.2	0.50	0.16	0.5	0.40	0.90	105
Leeks	91.8	1.20	0.50	5.8	0.70	0.90	150
Celery	93.4	1.40	0.10	3.3	0.90	0.90	85
Celery, cooked	97.0	0.30	0.06	0.8	0.50	1.00	85
Turnip cabbage	87.1	2.60	0.20	7.1	1.50	1.30	145
Rhubarb	94.6	0.70	0.70	2.3	0.60	1.10	105
Macedoine (tinned)	93.1	1.40	0.70	4.5	1.00	1.10	110
Water-cress	93.1	0.70	0.50	3.7	1.30	0.10	110
Cucumber	95.9	0.80	0.10	2.1	0.40	0.50	70
Cucumber, cooked	97.4	0.50	0.02	0.7	0.20	0.90	70
Asparagus	91.7	2.20	0.20	2.9	0.90	2.10	110
Salsify, cooked	87.2	1.20	0.08	9.0	0.30	2.20	110
Endive	94.0	1.00	0.08	3.0	0.80	0.60	110
Savoys	87.0	3.30	0.70	6.0	1.60	1.20	110
Red cabbage	90.0	1.80	0.19	5.8	0.70	1.20	110
Sauerkraut	91.0	1.40	0.70	2.9	1.70	0.90	110

Vegetarianism.—Theoretically, vegetarians are supposed to subsist entirely on an exclusive diet obtained from the vegetable kingdom, including vegetables, cereals, fruits, nuts, etc., but as a matter of fact, many add milk, butter, eggs, gravies and animal fats. The disadvantages of a strictly vegetable diet are too obvious to require much comment. It is possible to supply an adequate diet as regards fats, proteins and carbohydrates entirely from the vegetable kingdom and even to supply the vitamines, fat soluble A and water soluble B

and the proper amino-acids, but the danger of not getting a sufficient diet in every respect is so great that a strict vegetarian diet cannot be recommended for any length of time. This subject has received a large amount of experimental attention in feeding animals. Persons subsisting on a purely vegetable diet for any great length of time are apt to lose strength as well as physical and mental vigor and endurance. Laborers are unable to perform the same amount of work they could accomplish on a diet containing animal food. While vegetables contain large proportions of protein in order to furnish them in sufficient amounts, very large quantities have to be eaten. This overfeeding is apt, in many instances, to produce digestive disturbances, particularly in those suffering from gastro-intestinal disorders. A purely vegetable diet, if persisted in, is also said to lessen the powers of resistance.

FRUITS AND NUTS

FRUITS

Fruits are of little value as nutriments, and are useful mainly to give variety to the diet. They are used extensively as flavoring agents. The chief nutritive constituent of fruits is sugar, and they also contain a small amount of nitrogenous matters, cellulose, starches, organic acids, and a vegetable jelly called pectin, which causes fruit to gelatinize when boiled. The sugar present in fruit is mainly fruit-sugar, or levulose, but some fruits contain, in addition, considerable cane-sugar. In general, fruits contain a large amount of water, but less earthy salts than other foods. The mineral elements of fruit consist of potash, united with tartaric, citric, and malic acid. To these salts is due the antiscorbutic property of fruit. In addition to this property fruits also act as diuretics, laxatives, and cathartics. The flavor and odor of fruits are due to the presence of essential oils and compound ethers.

The digestibility of fruits varies with the kind of fruit eaten and its mode of preparation; stewed fruits are more easily digestible than raw fruits. Among the more easily digestible fruits are oranges, lemons, grapes, and peaches; raw apples, pears, and bananas are somewhat less digestible.

Lemons, limes, and **shaddocks,** possessing similar properties, are, for descriptive purposes, classed together. They are valuable antiscorbutics, and have an acid, pungent flavor that may be imparted to otherwise tasteless foods. A cooling and refreshing drink may be made from lemon-juice diluted with water and sweetened with a small quantity of sugar.

Oranges are used in invalid dietaries, their juice allaying thirst very effectively; it can be borne often by even the most irritable stomach.

Apples are wholesome, digestible, and slightly laxative. Fresh apples contain approximately 8 per cent. of sugar and 85 per cent. of water, but in drying two-thirds of the water is lost and the sugar is increased to about 45 per cent.

Pears are, as a rule, more easily digestible than apples, owing to the fact that their flesh is soft and their skin not so tough.

Peaches are wholesome and digestible. They contain less sugar than most fruits.

Bananas are the most nutritious of the raw fruits. The many varieties differ in digestibility and in flavor. Bananas are delicious when baked or grilled. The flour which is produced from dried bananas is very easily digestible.

Grapes contain a large amount of water and considerable sugar, besides salts of sodium, potassium, magnesium, calcium, and iron. When thoroughly ripe they are very digestible, and form a useful addition to the invalid diet. The habit of swallowing the skins and seeds of grapes is most pernicious, as intestinal irritation is often brought about in this way.

Raisins are prepared by drying grapes, the white ones being those most used. They are indigestible unless well cooked; they are usually added to puddings, sweetbreads, etc.

Plums and **green gages** are quite digestible when fully ripe. They soon overripen, however, and then are as harmful as when unripe.

Prunes are dried plums. They contain much sugar and are markedly laxative in their effect.

Olives have a bitter taste, and are eaten chiefly as a relish with salads. Their nutritive value is due to the oil they contain.

Strawberries are very wholesome unless taken in excess. They are quite rich in salts of sodium, potassium, and calcium, and have mild diuretic and laxative properties.

Currants, gooseberries, raspberries, huckleberries, mulberries, and a few other berries contain considerable amounts of free acids. They have slightly laxative properties.

Melons contain over 95 per cent. of water and about 5 per cent. of other constituents; they are considered indigestible.

Figs and **dates** contain large quantities of sugar. In the eastern part of the United States they are seen only in the dried form, although in California, where they are raised, they may be obtained fresh. The value of the date as a food to the Arab is well known.

The Alligator Pear or Avocado.—This nutritive fruit has found great favor especially as a salad. It differs from most fruit in that it contains a very large percentage of fat, averaging as much as 20 per cent. and some varieties even very much more. It contains on an average, according to Jaffa, 2 per cent. of protein, 7 per cent. of

carbohydrate, 1.2 per cent. of mineral constituents and about 70 per cent. of water.

The following table, taken from Hutchison (p. 244), gives the composition of the various fruits:

	Water.	Proteid.	Ether extract.	Carbo-hydrates.	Ash.	Cellu-lose.	Acids.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Apples	82.50	0.40	0.5	12.5	0.4	2.7	1.0
Apples, dried	36.20	1.40	3.0	49.1	1.8	4.9	3.6
Pears	83.90	0.40	0.6	11.5	0.4	3.1	0.1
Apricots	85.00	1.10	0.6	12.4	0.5	3.1	1.0
Peaches	88.80	0.50	0.2	5.8	0.6	3.4	0.7
Green gages	80.80	0.40	0.2	13.4	0.3	4.1	1.0
Plums	78.40	1.00	0.2	14.8	0.5	4.3	1.0
Nectarines	82.90	0.60	0.2	15.9	0.6	4.3	1.0
Cherries	84.00	0.80	0.8	10.0	0.6	3.8	1.0
Gooseberries	86.00	0.40	0.8	8.9	0.5	2.7	1.5
Currants	85.20	0.40	0.8	7.9	0.5	4.6	1.4
Strawberries	89.10	1.00	0.5	6.3	0.7	2.2	1.0
Whortleberries	76.30	0.70	3.0	5.8	0.4	12.2	1.6
Blackberries	88.90	0.90	2.1	2.3	0.6	5.2	1.6
Raspberries	84.40	1.00	2.1	5.2	0.6	7.4	1.4
Cranberries	86.50	0.50	0.7	3.9	0.2	6.2	2.2
Mulberries	84.70	0.30	0.7	11.4	0.6	0.9	1.8
Grapes	79.00	1.00	1.0	15.5	0.5	2.5	0.5
Melons	89.80	0.70	0.3	7.6	0.6	1.0	0.5
Watermelons	92.90	0.30	0.1	6.5	0.2	1.0	0.5
Bananas	74.00	1.50	0.7	22.9	0.9	0.2	0.5
Oranges	86.70	0.90	0.6	8.7	0.6	1.5	1.8
Lemons	8.93	1.00	0.9	8.3	0.5	1.5	1.8
Lemon-juice	9.00	1.00	0.9	2.0	0.4	1.5	7.0
Pineapples	8.93	0.04	0.3	9.7	0.3	1.5	7.0
Dates, dried	2.08	4.40	2.1	65.7	1.5	5.5	7.0
Figs, dried	2.00	5.50	0.9	62.8	2.3	7.3	1.2
Figs, fresh	7.91	1.50	0.9	18.8	0.6	7.3	1.2
Prunes, dried	2.64	2.40	0.8	66.2	1.5	7.3	2.7
Prunes, fresh	8.02	0.80	0.8	18.5	0.5	7.3	2.7
Currants, dry	2.79	1.20	3.0	64 0	2.2	1.7	2.7
Raisins	1.40	2.50	4.7	74.7	4.1	1.7	2.7

NUTS

Nuts contain a large quantity of fat and a somewhat larger proportion of protein. They have but little food-value, and are eaten mainly as a dessert. The average composition of the nuts is:

Water	1– 4	per cent.
Protein	6–15	"
Fats	40–50	"
Carbohydrates	6–10	"

Owing to the large amount of cellulose, as well as the large proportion of fat they contain, nuts are not easily digested. The dense cellulose framework which makes nuts so indigestible can be destroyed

by grinding, and thus the nut made more easily digestible; such preparations as Nutrose, Bromose, and Nutmeal, of the Sanitos Nut Food Company, are prepared in this way.

Almonds contain much fat, but no starch and very little sugar, and they are, therefore, often utilized as a bread for diabetics.

Chestnuts contain a small amount of oil and a large amount of carbohydrates. They are often eaten raw, and are quite indigestible. Properly cooked they are very digestible.

Walnuts contain a large proportion of protein and fat, but are quite indigestible; in some individuals they produce a markedly laxative effect.

The **cocoanut** contains a large amount of fat and carbohydrate, but is exceedingly indigestible.

The following table, taken from Bulletin No. 122, United States Department of Agriculture, gives the composition of nuts as compared with that of other food-substances:

	Refuse.	Edible portion.	Composition and fuel-value of the edible portion.					
			Water.	Protein.	Fat.	Carbo-hydrates.	Ash.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Almonds	64.8	35.20	4.8	21.0	54.90	17.3	2.0	3030[1]
Brazil nuts	49.6	50.40	5.3	17.0	66.80	7.0	3.9	3329
Filberts	52.1	47.90	3.7	15.6	65.30	13.0	2.4	3432
Hickory nuts	62.2	37.80	3.7	15.4	67.40	11.4	2.1	3495
Pecans	53.2	46.80	3.0	11.0	71.20	13.3	1.5	3633
English walnuts	58.0	42.00	2.8	16.7	64.40	14.8	1.3	3305[1]
Chestnuts, fresh	16.0	84.00	45.0	6.2	5.40	42.1	1.3	1125[1]
Chestnuts, dried	24.0	76.00	5.9	10.7	7.00	74.2	2.2	1875[1]
Acorns	35.6	64.40	4.1	8.1	37.40	48.0	2.4	2718
Beechnuts	40.8	59.20	4.0	21.9	57.40	13.2	3.5	3263
Butternuts	86.4	13.60	4.5	27.9	61.20	3.4	3.0	3371
Walnuts	74.1	25.90	2.5	27.6	56.30	11.7	1.9	3105[1]
Cocoanut	48.8	51.20	14.1	5.7	50.60	27.9	1.7	2986
Cocoanut, shredded	48.8	100.00	3.5	6.3	57.30	31.6	1.3	3125[1]
Pistachio kernels	48.8	100.00	4.2	22.6	54.50	15.6	3.1	3010[1]
Pine-nut or *Pinon pinus edulis*	40.6	5.94	3.4	14.6	6.19	17.3	2.8	3364
Peanuts, raw	24.5	7.55	9.2	25.8	38.60	24.4	2.0	2560[1]
Peanuts, roasted	32.6	67.40	1.6	30.5	49.20	16.2	2.5	3177
Litchi nuts	41.6	58.40	17.9	2.9	0.20	77.5	1.5	1453
Beefsteak	12.8	87.20	61.9	18.9	18.50		1.0	1130[1]
Wheat flour	12.8	100.00	12.8	10.8	1.10	74.8	0.5	1640[1]
Potatoes	20.0	80.00	78.3	2.2	0.10	18.4	1.0	385[1]

[1] These values were calculated: unless otherwise indicated the fuel-values were determined.

FUNGI, ALGÆ, AND LICHENS

Fungi.—The three varieties of fungi usually eaten are the mushroom, truffle, and morel.

Mushrooms are prized chiefly for their agreeable taste. They possess some nutritive value, being rich in nitrogenous matter, this material, however, occurring in such form that it is but slightly absorbed. They are apt to produce gastro-intestinal irritation, and disagree with many persons.

The **truffle** grows underground, and is especially sought for on account of its delicate flavor; the black variety is considered the finest.

The **morel** is usually obtained from France. It is sold in the dried state, and is utilized chiefly for seasoning purposes. The following table, by König, gives the composition of the mushroom, truffle, and morel:

	Mushroom.	Truffle.	Morel.
Water	91.11	72.80	90.00
Nitrogenous matter	2.57	8.91	3.48
Fat	0.13	0.62	0.24
Grape-sugar and mannite	1.05	——	0.72
Other non-nitrogenous substances	3.71	7.54	3.95
Woody fiber	0.67	7.92	0.67
Ash	0.76	2.21	0.94

Many fungi are poisonous, and these are usually distinguished by a disagreeable odor and taste, and other peculiarities in structure, etc. Gibson, who has made a study of edible fungi, considers that the usual methods of distinguishing between the edible and poisonous varieties are very unreliable. He suggests the following as being of especial value: First avoid every mushroom having a cup or suggestion of such at the base; the distinctly fatal poisons are thus excluded. Exclude those having an unpleasant odor, a peppery, bitter, or other unpalatable flavor, and those of tough consistency. In addition, it is well to exclude those infested with worms, those in advanced age, or partly decayed, and in testing new species they should be kept apart from the others. The best test is to begin with a piece the size of a small pea, chew it very slightly, being careful not to swallow any of the saliva, and finally expel all from the mouth. If no results follow during the interval of a day the experiment may be repeated, swallowing a little of the juice, the fragments of the fungus being expelled as before. In twenty-four hours the third trial may be made, swallowing a small fragment, and if still no unpleasant results follow, the following day a piece the size of a hazel nut may be attempted. In using this method poisonous varieties may be excluded with only a temporary indisposition on the part of the ex-

perimentalist, and is the only safe method of avoiding the poisonous varieties. As a rule, any mushroom, omitting the *Amanita*, which is pleasant to taste and agreeable as to odor when raw, is probably harmless, and, if an unfamiliar species, may be tested by the above method. (For an excellent description of the various fungi the reader is referred to Farmers' Bulletin No. 15, United States Department of Agriculture.)

Algæ.—The only one of this group that is utilized as food is **Irish moss.** Its most important constituent is lichenin, a mucilage. It is made into a soothing drink for patients suffering from throat irritation.

Lichens.—The only important lichen used as a food is **Iceland moss.** It contains two carbohydrates: (1) lichenin, a gelatinous substance; (2) isolichenin, which resembles starch. Iceland moss is utilized as a food in the Arctic regions. It has been made into a bread that has been recommended by Senator for diabetics.

SUGARS

Sugars are carbohydrates that contain hydrogen and oxygen in a proportion to form water. Sugar is one of the most valuable and popular forms of food. This popularity is due not only to its nutritive value, but also to its pleasant taste. According to Abel,[1] 86 pounds of sugar per capita were consumed in England in 1895 and 64 pounds in the United States in the same year. From 7,000,000 to 8,000,000 tons are consumed annually in the different countries of the world. The principal variety of sugar in use is cane-sugar; besides this, grape-sugar, fruit-sugar, and milk-sugar also enter into the composition of our foods. Sugar is obtained in a fluid state, as in honey, as well as in crystalline form.

Sugar is very fattening and at the same time is also a great source of muscular energy. The negroes working in the sugar plantations in the West Indies show the effect of eating sugar during the harvest season; they chew the sugar-cane constantly, in consequence of which their weight and muscular development increase most remarkably. Sugars and starch are said to be identical in nutritive value, owing to the fact that both must be converted into dextrose before they can be absorbed. Most of the ill effects attributed to the use of sugar are due to the fact that more than one-quarter of a pound is consumed daily (Hutchison); this amount may be taken with impunity by the healthy adult, but if more be taken, it will be excreted rapidly by the kidneys, giving rise to a condition known as temporary or alimentary glycosuria. Hutchison (p. 270) gives the following figures as the maximum amounts of the various sugars necessary to produce alimentary glycosuria:

[1] Farmers' Bulletin No. 93, United States Department of Agriculture, 1899.

For lactose	120	gm.
" cane-sugar	150–200	"
" levulose	200	"
" dextrose	200–250	"

Sugar can be absorbed only as dextrose and as levulose, all varieties of sugar being converted into these forms before they are absorbed. In strong solution sugar irritates the mucous membrane of the stomach, and is apt to undergo fermentation and thus produce gastro-intestinal distress. Robertson [1] gives the following table, arranged according to the rapidity with which sugars are apt to ferment:

Lactic.	Butyric.	Alcoholic.
Levulose (most fermentable).	Levulose (most fermentable).	Maltose (most fermentable).
Lactose.	Maltose.	Invert-sugar.
Dextrose.	Dextrose.	Cane-sugar
Invert-sugar.	Invert-sugar.	Dextrose.
Cane-sugar.	Cane-sugar.	Levulose.
Maltose.	Lactose.	Lactose.

Cane-sugar is the most common and most extensively used form of sugar. It is made chiefly from sugar-cane and from the sugar-beet. When pure, it consists of a mass of white crystals. It is soluble in one-half its weight of cold water and in even less of hot water. In order to obtain the sugar from the cane the canes are crushed and the fluid obtained treated with sulphurous acid, neutralized with lime, and boiled; it is then filtered and evaporated, when the sugar crystallizes out. The sugar is still further refined by remelting and filtering through charcoal.

Caramel is made by heating refined cane-sugar to 400° F., when it is melted and browned. The resulting brown substance is called caramel. It has a bitter taste, and is often used as a flavoring agent, especially for invalid foods.

Candy contains a large amount of sugar, besides butter and other fats, starch, nuts, flavoring extracts, etc. The chief varieties of candy are made up largely of glucose and starch, colored with anilin dyes. Thompson says: "Children assimilate candy better than adults because they are less liable to dyspepsia, and because of their relatively active muscular energy and relatively large body surface for losing heat, in proportion to their size. They do not, as a rule, care for fat meat, and prefer sweets as a natural substitute." Contrary to popular belief, there is no evidence to show that candy produces any injurious effect on the teeth.

Molasses, Treacle, and Syrup.—Molasses and treacle are by-products formed in the manufacture of cane-sugar. Molasses forms a highly nutritious food. On account of the impurities it contains molasses has a more pronounced aperient effect than refined syrup.

[1] Edinburgh Med. Jour., March, 1894.

Besides cane-sugar and certain acids, etc., molasses contains about 30 per cent. of invert-sugar and the same amount of water.

Hutchison (p. 264) gives the following table showing the composition of molasses, treacle, and syrup:

	Molasses.	Treacle.	Syrup.
Cane-sugar	47.0	32.5	39.0
Fruit-sugar	20.4	37.2	33.0
Extractive and coloring-matter	2.7	3.5	2.8
Salts	2.6	3.4	2.5
Water	27.3	23.4	22.7

Glucose, or **grape-sugar,** is chiefly made from starch by inversion or hydrolysis. It is not nearly so sweet as cane-sugar, and crystallizes with difficulty. It is present in small quantities, in combination with other varieties of sugar, in most fruits. When taken in excess, glucose appears in the urine unchanged.

Lactose, or **sugar of milk,** is the natural carbohydrate for the young, growing infant.

Dextrimaltose.—Concerning this and similar preparations see Infant Feeding.

Honey is sugar in a concentrated solution. It is made by bees from the nectar gathered from various flowers. It contains a crystallizable sugar, resembling glucose, and a non-crystallizable form. Honey was formerly used as a sweetening agent, but cane-sugar, on account of its cheapness and abundance, has largely superseded it. Besides sugar, honey contains wax, gum, and coloring substances.

Saccharin is used largely as a substitute for sugar in cases of rheumatism and diabetes. After long-continued use of large quantities of saccahrin digestive disturbances are apt to be produced.

Levulose, or **fruit-sugar,** is also utilized as a form of sugar in certain cases of diabetes.

SPICES AND CONDIMENTS

Spices and condiments play an important rôle in increasing the appetite and aiding the digestive functions; they have practically no nutritive value. By the action of these substances on the organ of taste as well as on the mucous membrane of the stomach the appetite is stimulated and the secretion of gastric juice increased. In certain gastric disturbances, as well as in diseases of the kidneys, they act as irritants and should be avoided. Some spices act as food preservatives.

The **peppers** are among the favorite spices; there are two varieties, the white and the black.

Mustard.—Mustard is used chiefly in salads or with other foods, and has a marked tendency to increase the appetite. There are two forms of mustard: that which is obtained from the black mustard

plant and that derived from the white mustard plant. In large quantities and diluted with water mustard acts as an irritant to the stomach, producing nausea and vomiting.

Vinegar is produced from various alcoholic drinks and from fruits. It contains 5 per cent. of acetic acid. By its action on the cellulose of vegetables vinegar softens the fiber, so that it not only acts as a condiment, but also assists in the digestion of the cellulose; for this purpose it is added to such vegetables as cabbage, lettuce, and cucumbers.

Horseradish is a condiment that is much used with various foods; it stimulates the flow of saliva as well as of the gastric secretion.

Sauces, such as tomato, catsup, Worcestershire, and the like, increase the appetite and give a relish to certain foods.

Spices act merely by adding a flavor to foods, in this way increasing the appetite for food that would otherwise be insipid. Those most in use are ginger, cinnamon, nutmeg, and cloves.

FATS AND OILS

One-fifth of the body-weight consists of fat. This is obtained in part from fatty food and in part from the carbohydrates and the proteins. Most of the heat energy furnished the body is supplied by fat; it oxidizes very rapidly, and in this way spares the protein elements that would otherwise be required to furnish energy. Fats are digested in the intestine, where they are emulsified previous to being absorbed. The most useful forms of fat are cream and butter; other forms are bacon and cod-liver oil. When eaten too liberally, fats are apt to cause indigestion, and when this exists, they should be taken only in very restricted quantities.

Foods fried in fat are indigestible, and hot fats are more indigestible than cold. Fats and oils have a tendency to relieve constipation, but are counterindicated in diarrhea.

The most important animal fats are butter, cream, lard, suet, oleomargarin, cottolene, butterine, cod-liver oil, and bone-marrow. Of the vegetable fats, those most commonly employed are olive oil, cottonseed oil, linseed oil, cacao-butter, and the oils obtained from nuts, such as cocoanut oil, peanut oil, and almond oil.

Hydrogenation of Oils.—A method has been discovered by which hydrogen may be added to cheap vegetable oil, converting them into substances having a close resemblance to the animal fats. Finely divided nickel oxide is used in the process and at present small amounts of nickel may still occur in these products, rendering them undesirable as human foods.

Indications for the Use of Fatty Foods.—Fatty foods are indicated especially in wasting disorders and in convalescence from certain acute diseases. They are needed particularly in tuberculosis,

rachitis, chronic bronchitis, and chronic diseases accompanied by the formation of abscesses.

There are many proprietary fatty foods on the market, some of which are worthy of mention. In most of these the fats, usually cod-liver oil, have been emulsified; this emulsification aims to make the oil less objectionable to the taste and also to render it more easily digestible.

The Use of Olive Oil in the Treatment of Certain Diseases.—The external and subcutaneous use of olive oil will be discussed further on. Chaufford and Dupre were the first to advocate the use of olive oil in the treatment of *cholelithiasis.* They recommended that two doses of 400 grams each be given at half-hour intervals, the patient being directed to lie for three hours on his right side. The use of olive oil in the treatment of this condition has subsequently been advocated by Walker, Vettsteiner, and others.

Rosenheim has advised the use of olive oil in the treatment of *stricture of the esophagus* due to carcinoma. After allowing a small quantity of oil to flow into the esophagus, patients who were unable to swallow before have frequently been enabled to swallow fluids and semisolids.

Cohnheim[1] has advocated the use of large quantities of olive oil in the treatment of certain forms of *gastric disorder.* In cases of gastric dilatation he usually administers the oil once daily, in the morning before breakfast, in doses of from 100 to 150 c.c.; in those instances in which lavage is practised the oil is given immediately after this procedure. After taking the oil the patient is required to lie on his right side for from fifteen to twenty-five minutes, and is not permitted to partake of any food for an hour. The oil is administered warm, at about the body-temperature. If, notwithstanding this procedure, the patient still continues to suffer pain, 50 c.c. are again given at night, before retiring. Later Cohnheim orders that a wineglassful be taken one hour before breakfast and two dessert-spoonfuls from one to two hours before dinner and before supper. In simple forms of ulcer he recommends that the olive oil be used only in the morning, and the emulsion of sweet almonds (see below) at noon and night; most patients do not object to the taste of the oil. According to Cohnheim, in those instances in which the taste of the oil is objected to, this may be overcome by taking a pinch of salt, a swallow of brandy, or by allowing a peppermint drop to dissolve in the mouth. The oil treatment must be continued over a period of weeks or months. Cohnheim's conclusions are as follows:

"1. Cases of dilatation of the stomach due to spasm caused by an ulcer or fissure at the pylorus are cured or at least markedly relieved by the use of large quantities of oil (100 to 150 grams).

"2. Cases of stenosis of the pylorus due to organic disease with

[1] Zeitschr. f. klin. Med., vol. lii., pts. 1 and 2; p. 110.

secondary dilatation are also usually relatively cured by the use of large quantities of oil; that is, these patients are freed from disturbances while leading an abstemious life. In these cases the oil acts mechanically by relieving friction.

"3. Cases of relative stenosis of the pylorus and duodenum which are clinically marked by a continuous hypersecretion and pylorospasm several hours after the principal meals, are much improved or cured by the oil treatment.

"4. The pylorospasm found in cases of carcinoma of the pylorus is much diminished or relieved by the oil treatment.

"5. Cases of ulcer of the pylorus associated with or without hyperchlorhydria are quickly cured by means of the oil treatment or by an emulsion of sweet almonds.

"6. The oil is best taken three times daily, half to one hour before meals; as a rule, it is best to administer a wineglassful early in the morning and two dessertspoonfuls before dinner and supper. In mild cases an emulsion of sweet almonds may be substituted for it.

"7. The oil fulfils three indications: it overcomes pylorospasm; it relieves friction, and tends to improve the general nutrition.

"8. The oil acts as a narcotic in cases of pylorospasm, producing, however, no unfavorable effect—neither eructations nor diarrhea.

"9. No favorable effect of the oil treatment has been found in purely hysteric gastric colics.

"10. In that form of gastric neurosis manifested by pain when the stomach is empty very favorable symptomatic relief has been obtained from the use of olive oil.

"11. A certain number of cases of stenosis of the pylorus accompanied by a consequent gastrectasia can often be so much relieved by the oil treatment that no operative procedure need be undertaken. A trial should be made of the oil treatment in all cases of stenosis of the pylorus before advising operative procedure.

"12. The treatment prevents prophylactically the production of gastrectasia and prevents relapses when utilized in favorable cases."

Olive Oil in the Treatment of Chronic Dysentery.—Rutherford [1] gives his results with olive oil in the treatment of chronic dysentery. According to him, "Upon the internal administration of olive oil typical cases of chronic dysentery practically without exception show changes in their condition as follows:

"1. Positive evidence of increased quantities of bile in the feces.

"2. Decrease in the number of daily bowel movements and marked improvement in the character of the same.

"3. Gradual cessation of signs of fermentation and putrefaction along the intestinal tract and consequent subsidence of pain and tenderness.

[1] American Medicine, March, 1904.

"4. General systemic improvement; gain in appetite; repair of digestive faculties; symptoms of improved nervous system; and rapid gain in weight and strength.

"5. Apparent positive cure after an average time of two months and upward, with few recurrences."

The method of carrying out the treatment is as follows:

"*First Period.*—The patient is given one ounce (30 c.c.) of olive oil three times a day for the first three days, when the quantity is increased to two ounces (60 c.c.) three times daily, and on the sixth day the same quantity is given four times a day. During the first three days the patient is to be kept on a milk diet. During the latter half one to three ounces (30–90 c.c.) of scraped beef or its equivalent of egg-albumin will be added daily. During this treatment a slight loss in weight may be temporarily noticed.

"*Second Period.*—During this period the amount of oil is given in greater quantities (not less than three ounces—90 c.c.—three times a day without discomfort to the patient), and must be kept up for a length of time in severe and chronic cases; perhaps for two months or longer, during which period convalescence will have been established and the weight regained.

"*Third Period.*—During this period the patient is gradually restored to a full diet, and the oil decreased in amount until the ulcers have permanently healed and a recurrence not probable."

Blum first advocated the use of olive oil by rectal injection for the treatment of *gall-stone colic,* and claims good results from its use. Fleiner first recommended the use of copious oil injections—400 to 500 c.c.—in the treatment of certain forms of *chronic constipation.* Remarkable results are produced in the spastic forms of chronic constipation when this quantity of oil is injected two or three times weekly. The oil should be heated to the body-temperature, and injected high at bedtime and retained during the night; the same precautions should be observed as in giving nutrient enemata. (See same.)

The Use of Emulsion of Sweet-almond Oil in the Treatment of Certain Gastric Disorders.—Cohnheim [1] recommends an emulsion of almonds in those cases in which olive oil is not well borne. In effect it is identical to olive oil, previously described, relieving spasm and irritation; on the other hand, it lacks the nutritive value of olive oil. On account of its more pleasant flavor it is preferred by some. Cohnheim gives the following directions for preparing an emulsion of almond oil: A dessertspoonful of sweet almonds are blanched by scalding with hot water and removing the skins; after being allowed to dry they are ground into a powder and placed in a cup of boiling

[1] Zeitschr. f. klin. Med., vol. iii, Nos. 1 and 2.

water; this mixture is next rubbed by means of a spoon, and strained through a piece of gauze; a quantity equal to from 200 to 250 grams should be obtained from a dessertspoonful of almonds. The emulsion should be taken warmed and sweetened one-half hour before meals, in order to relieve any irritation at the pylorus and to prevent spasm in this portion of the stomach.

The various fats still to be mentioned are butterine, oleomargarin and bone-marrow.

Butterine is a fat prepared from beef and hog's fat, and is frequently used in this country instead of butter; **oleomargarin** is a similar preparation made from beef fat. Both butterine and oleomargarin are wholesome fatty foods, the only objection against them being that they are often sold fraudulently for butter and that they do not contain the vitamins that are in butter.

Bone-marrow is a fat obtained from the large bones of the ox. It is used in the treatment of tuberculosis and in the various forms of anemia, especially in pernicious anemia. The marrow of young animals is usually preferred. A preparation known as the glycerin extract of bone-marrow is often utilized.

Kohn[1] has succeeded in preparing an odd carbon **fatty acid fat**, which is edible. It is absorbed to about 90 per cent. and is katabolized in the body and does not yield the ketone substances derived from butyric acid. In this the stearic acid has its acid group substituted by an organic radical, and upon oxidation margaric acid is produced. This is easily purified and united with glycerol to form a neutral fat.

This fat is of a white, creamy color, colorless and odorless, melting at 38° C., and is neutral in reaction. It is palatable and does not produce nausea and appears to satisfy the hungry craving for fats in diabetes without the formation of ketones. The diabetic patient's diet may be increased by this fat. It prevents the loss of flesh and may be fed in large amounts. This fat can now be obtained on the market and is known as "Intarvin Fat."

SALTS

The principal mineral constituents of the body are the chlorids, phosphates, sulphates, carbonates, fluorids, and silicates of potassium, sodium, magnesium, calcium, and iron. Iodin is present especially in the thyroid gland, and the other halogens are also found in the body. The amount of heat and energy supplied by salt metabolism is so small as to be practically disregarded, but the salts play a most important part in the metabolic process and also maintain osmotic pressure. They are also essential to nervous and muscular reaction.

The mineral salts taken in the body in the food are excreted in the feces, the urine, sweat, and also in the exfoliation of epidermis, the

[1] Amer. Jour. Med. Sci., December, 1923, p. 826.

hair, and the nails. The average amounts of the various compounds excreted are shown in the table below.

Mineral Matter Contained in the Urine, Feces, and Sweat of Man. (Gautier, after Bischoff, Voit, Wehsarg, Magnier, and Lapicque).

	Urine of 24 hours.	Fecal material of 24 hours.	Sweat of 24 hours.
	Grams	*Grams.*	*Grams.*
Water	1220–1350	100–119	750–850
Saline material	17.3–22	4.35–6	1.6–2.4
These salts comprise:			
Chlorin	4.9–7.2	0.015–0.035	1.12
Phosphoric anhydrid (P_2O_5) (pentoxid)	1.6–3	0.76–0.82	Traces.
Sulphuric anhydrid (SO_3) (trioxid)	1.4–2.26	0.06–0.17	0.005
Silicic anhydrid (SiO_2) (dioxid)	0.003–0.004	0.17–0.35	0.005
Carbonic anhydrid (CO_2) (dioxid)	0.003-0.004	0.05	0.005
Potassium oxid (K_2O)	1.6–3.1	0.75–0.30	0.178
Sodium oxid (Na_2O)	4.16–5.9	0.25–0.35	0.80
Calcium oxid (CaO)	0.25–0.36	0.65–0.70	Traces.
Magnesium oxid (MgO)	0.56–0.36	0.65–0.70	Traces.
Ferric oxid (Fe_2O_3)	0.004–0.013	0.023–0.04	Traces.

Ash analyses may be misleading as far as phosphoric and sulphuric acid are concerned, as they may be artificial products from nuclein-containing substances. It will be seen that animal food contains relatively few bases, whilst vegetables contain large quantities of the alkaline bases and also phosphoric acid. The alkaline bases are, however, always in excess.

The metabolism of the salts in the body plays a very important part in the physiology of nutrition, and disturbances of this salt metabolism may be the cause of disease. This subject is as yet but little understood, but the therapy of the future will undoubtedly depend upon the practical application of the principles of nutrition. If the salts are withdrawn entirely death results, and Forster and others have shown that dogs fed upon foods from which the salts had been extracted by water die in from 26 to 36 days. If salts are given in excess they are excreted, but if greatly in excess, may be retained in the body and cause untoward symptoms. Under certain conditions even small amounts may be retained or, on the other hand, salts may be excreted in such quantity in the urine that they cannot be held in suspension, and are consequently deposited in the urinary tract and cause stone.

Animal food contains sulphur and phosphorous compounds, which by oxidation in the body are changed into sulphuric and phosphoric acids, which tend to render the blood and tissues acid. The destructive metabolism of the tissues of the body tends toward the same end. The vegetable foods, the cereals excepted, contain large amounts of

Mineral Matter Contained in the Principal Organs—for 1000 Parts of the Fresh Organs.—(Gautier.)

	Muscles of mammals.	Nervous tissue.	Bone.	Liver.	In 1000 parts of blood. Corpuscles.	Plasma.	Lymph.
	Grams.	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
Mineral matter per 1000 grams of fresh substance	9–12	2–7	620–690	9 to 11	6.5 to	7.1	7.47
Chlorin	0.5–0.7	0.4	0.6–0.7	0.25–0.42	0.36–0.9	1.7–1.4	3.08
P_2O_5	3.4–5	0.85–1.4	196–247	5.02–4.27	0.69–0.65	0.71–2.2	0.18
SO_3	2.2	0.14	0.20	0.09–0.092	0.69–0.65	0.71–2.2	0.09
SiO_2	2.2	0.14	0.20	0.027–0.018	0.69–0.65	0.71–2.2	0.09
K_2O	3–3.9	0.71–2.12	0.20	2.52–3.47	1.6–1.4	0.15–0.20	0.16
Na_2O	0.4–0.7	0.75–1.3	0.20	1.45–1.13	0.24–0.65	1.66–1.9	3.07
CaO	0.9–0.18	0.03	270–500	0.36–0.03	0.19–0.25	0.06–0.08	
MgO	0.4	0.065–0.75	4–6	0.02–0.007	0.07	0.02–0.05	0.15
Fe_2O_3	0.03–0.02	0.04–0.12	4–6	0.27–0.17	0.77	0.006	0.15
CO_2	0.03–0.02	0.21–0.33	3.2–4.5	0.27–0.17	0.77	0.006	0.50

alkaline bases, which tend to neutralize the acids and to render the tissues alkaline. A small amount of the acids formed in the metabolic processes is neutralized by the ammonia from the protein, and this

is excreted as ammonium salts, and takes the place of the alkaline salts from vegetable foods. The daily needs of the body are summarized by Gautier as follows for the average adult:

Bases.	*Grams.*	*Acids.*	*Grams.*
K_2O	3.22	P_2O_5	3.9*a*
Na_2O	7.70*b*	SO_3	2.03*a*
CaO	1.47	SO_2	0.25
MgO	0.56	Cl	8.50*a*
Fe_2O_3	0.04	CO_2	0.05

(*a*) The food does not in reality contain 3.9 grams of P_2O_5 and the 2.03 grams of sulphur trioxid indicated, but contains phosphorus and sulphur, which if reduced to the given compounds would yield these figures.

(*b*) This comprises the amount of sodium chlorid taken in twenty-four hours.

Alimentary Alkalis.—The average ration of 110 grams of protein food furnishes about 1 gram of sulphur, about four-fifths of which is oxidized in the body, and gives about 2 grams of sulphuric trioxid, SO_3. The phosphorus yields about 0.3 gram of phosphoric pentoxid a day. To neutralize these it requires 2.3 grams of K_2O or a corresponding amount of Na_2O. Bunge gives the following table of potassium and sodium worth of various foods:

In 1000 parts of dried substance the proportions are:

Arranged according to increasing amount of potassium.	K_2O.	Na_2O.	Arranged according to increasing amounts of sodium.	Na_2O.
Rice	1	0.03	Rice	0.03
Bullock's blood	2	19	Apples	0.1
Oats, Wheat, Rye, Barley	5–6	0.1–0.4	Beans	0.13
			Peas	0.2
Dog's milk	5–6	2–3	Oats, Wheat, Barley, Rye	0.1–0.4
Human milk	5–6	1–2		
Apples	11	0.1	Potatoes	0.3
Peas	12	0.2	Human milk	1.0–2.0
Milk of herbivora	9–17	1–10	Dog's milk	2–3
Beef	19	3	Milk of herbivora	1–10
Beans	21	0.1	Beef	3.0
Strawberries	22	0.2	Bullock's blood	19.0
Potatoes	20–28	0.3–0.6		

The potassium salts are thought to be a factor in exciting the action of the oxidizing ferments, but this function is not attributed to the sodium salts. The potassium salts form carbonates, and these meeting the sodium chlorid in the blood and tissues, a partial exchange takes place with the formation of potassium chlorid and sodium carbonate. The potassium salt is excreted in the urine, whilst the sodium is set free by the action of the hydrochloric acid, which saturates the peptones, or unites with the sulphuric or phosphoric acid, forming sulphates or phosphates, which are excreted in the urine. Part of the potassium salts goes to form organic compounds.

A certain amount of sodium chlorid is constantly present in the blood, and this aids in the excretion of the products of metabolism. Increasing the salts causes an increase in the amount of urine passed, and this is merely the means of maintaining the normal balance of the salts. Increasing the amount of salt taken causes great thirst, and may be the cause of the ingestion of large quantities of water. The effect of hyperchloridation and hypochloridatives in various nervous diseases has been studied by Vincent, Claude, and others. In healthy individuals the complete withdrawal of salt is followed by the appearance of certain symptoms, chief of which are lassitude, an incapacity for work, dyspepsia, and cramps. These symptoms are promptly relieved by restoring the usual allowance of salt. On the other hand, a salt-free diet or a lowered salt allowance seems to have a beneficial effect in some nervous diseases, as in epilepsy, in which disease it increases the action of the bromids. It has been suggested that a salt-free diet be tried in hysteria and some of the other functional nervous troubles, as an addition of 12 to 15 grams of salt to the diet in hysteria aggravates the condition very much, and in latent hysteria may make it manifest. The effect of a salt-free diet in edema is noted in the section on Nephritis. Animals which feed exclusively upon meat do not need salt, a fact pointed out by Bunge. The acids formed in metabolism in these animals is neutralized by bases formed by the breaking down of protein. Potassium salts being present in vegetables causes an excess of potassium in the blood. In order to eliminate this, as explained above, a large amount of sodium chlorid is necessary. All graminivorous animals need salt, and the same is true of man, who is omnivorous. The average individual takes more than there is any necessity for, however, the taste for this flavor leading to excesses. An average amount for an adult is from 20 to 30 grams a day.

In addition to what has been said above, chlorine is stored in the body as a reserve to serve in time of need should the diet be too low in chlorine. It has been stated that 3 or 4 grams of chlorine are needed daily to protect the average sized adult from chlorine loss, but this must vary, greatly, depending on the character of food taken, as noted above. When excessive quantities of sodium chloride are taken nitrogen excretion is accelerated. McCollum and his co-workers have pointed out that an excess of chlorine and possibly of sodium in the diet of rats leads to a xerophthalmia similar to that noted when there is a lack of vitamin A.

The Halogens.—The elements chlorin, iodin, bromin, and fluorin are taken into the body in food or drink. The most important, chlorin, is taken principally as sodium chlorid.

Iodin is found in nucleoproteins and especially in the thyroid gland, which contains 0.075 to 0.13 per cent. It is also found in the other organs. Gautier gives the following tables (after P. Bourcet), showing the iodin content of various food:

Iodin per Kilogram of Fresh Material.

Green beans	0.32	Green peas	0.80
Bananas	0.31	Tomatoes	0.23
Asparagus	0.24	Grapes	0.02–00
Garlic	0.21	Artichokes	0.017
White cabbage	0.21	Pears	0.017
Mushrooms	0.172	White dried beans	0.014
Strawberries	0.17	Lettuce	0.012
Rice	0.17	Potatoes	0.01
Carrots	0.134	Oatmeal	0.009
Sorrel	0.12	Wheat flour	0.007
Leeks	0.12	Bread	0.000

Iodin per Kilogram in Some Animal Foods.

Gray shrimp	5.91	Breme	1.25
Crabs	1.82	Fresh cod	1.32
Lobster	1.78	Anchovies	0.95
Smoked herring	1.57	Tunny, fresh	0.88
Fresh salmon	1.40	Eel	0.80
Roach	1.38	Whiting	0.31
Oysters	1.32	Trout	0.08

Fish, fruits, and starchy vegetables manifestly furnish most of the iodin.

Bromin is found in the nuclear proteins and is excreted in the sweat. Foods which contain iodin also have bromin in them, although not in the same quantities. Fluorin is present in the body and is taken in with the drinking-water.

Sulphur.—Sulphur is contained in both animal and vegetable proteins. Four-fifths of the sulphur taken is oxidized and excreted in the urine either as sulphates or phenol sulphates, the remainder enters into compounds of more complex composition. About 1 gram of sulphur is excreted daily by an adult.

Phosphorus.—This element is found in the body in large quantities. Voit has estimated that a man weighing 70 kilos (154 pounds) contained 1400 grams in the bones, 130 grams in the muscles, and 12 grams in the brain and nerves. It also occurs in the body-fluids. In foods it is found in the form of the inorganic phosphates; in the form of simple organic derivatives of phosphoric acid and phosphates (phytin), etc.; in the form of phosphorized proteins, as nucleo-albumin, etc. The body is able to build up complex phosphorous compounds from that contained in the calcium phosphate and the other components of the body. Some studies have been made of phosphorus metabolism, particularly phosphorus equilibrium.[1] Apparently phosphorus equilibrium may be maintained on various amounts of phosphorus, depending on the amounts habitually ingested, and in this it resembles nitrogen. Sherman and others have determined that if the phosphorus is taken in the foods in the form of the organic compounds, that equilibrium may be maintained in

[1] See Bulletin 227, Office of Experiment Station, United States Department of Agriculture.

0.9 grams of phosphorus or about 2 grams of P_2O_5. On a full diet more is required, and they estimate from 1.5 grams of phosphorus daily or 3.5 grams of P_2O_5. The Danilevskys have shown that lecithin exerts a favorable influence on the metabolism of growing animals.

The yolk of egg is the most available and perhaps best form in which to increase the phosphorous content of the food. (See vitamins.)

The table which follows gives the data regarding the calcium, magnesium, and phosphorus content of food materials.

Iron.—The human body of average size (65 kilos) is supposed to contain from 3 to 4 grams of iron, chiefly in the hemoglobin of the blood and in the chromatin substance in the nuclei. The amount of iron needed daily is estimated at about 0.015 gm. To secure the absorption of this amount larger quantities must be ingested. The amount of iron excreted daily as waste is very small: in fasting 0.007 to 0.008 gram, and in restricted diets to 0.0055 to 0.0125 gram. The iron in the food is absorbed from the small intestine, and is distributed chiefly to the liver, spleen, and bone-marrow. After being utilized the waste iron is excreted through the walls of the intestine, and a very little by the kidneys and in the bile. The iron used in the body is probably all derived from the food, although inorganic iron undoubtedly is absorbed and is deposited and excreted much the same as the iron in the food. The more recent authorities believe that the chief use of inorganic iron so often administered is to stimulate the blood-making organs. There can be no question, however, about the advisability of administering iron.

Approximate estimates made by Sherman of 20 American dietaries showed a minimum of 7 milligrams per man per day in a negro family in Alabama to 35 milligrams in Maine lumbermen.

The iron in the diet ordinarily used corresponds nearly to the amount of protein used. The variations of the iron in an ordinary diet containing 100 grams of protein are from 15 to 20 milligrams.

Animals fed on diets poor in iron become anemic. Young animals thrive on milk which is poor in iron, but this is explained by Bunge, who has shown that the bodies of animals which live upon milk contain at birth a large amount of iron which is sufficient to tide them over until they take food richer in iron. Woman's and cows' milk contain approximately the same amounts of iron, but infants fed on dilutions of cows' milk may become anemic, owing to the very small amount of iron taken.

The amount of iron derived from vegetables and fruits has not received proper attention in the past and it should also be borne in mind that milling cereals lessens the iron content considerably.

Manganese.—This metal is found in the body in minute quantities, and small amounts are found in some food materials. The ash of

Ash Constituents of Foods in Percentage of the Edible Portion

(Compiled from Various Sources by Prof. H. C. Sherman, and Reproduced Through the Courtesy of the Macmillan Company)

Food	Calcium (Ca)	Magnesium (Mg)	Potassium (K)	Sodium (Na)	Phosphorus (P)	Chlorine (Cl)	Sulphur (S)	Iron (Fe)
Almonds	.239	.251	.741	.019	.465	.037	.160	.0039
Apples	.007	.008	.127	.011	.012	.005	.006	.0003
dried	.032	.037	(.623)	(.050)	.048	(.025)	?	(.0015)
Apricots	.014	.010	.248	.038	.025	.002	.010	(.0003)
dried	(.066)	(.047)	(1.157)	(.177)	(.117)	(.009)	?	(.0014)
Asparagus	.025	.011	.196	.007	.039	.039	.041	.0010
Bacon (See Meat)								
Bananas	.009	.028	.401	.034	.031	.125	.010	.0006
Barley, entire	.043	.141	.477	.076	.400	.016	.153	.0041
pearled	.020	(.070)	(.241)	(.037)	.181	(.016)	(.120)	(.0020)
Beans, dried	.160	.156	1.229	.097	.471	.032	.215	.0070
kidney, dry	.132	.139	1.144	.041	.475	.041	.227	.0072
Lima, dry	.071	.188	1.741	.249	.338	.026	.161	.0070
Lima, fresh	.028	(.070)	(.613)	(.088)	.133	(.009)	(.057)	.0020
string, fresh	.046	.025	.247	.019	.052	.024	.030	.0011
Beef (See Meat)								
Beer	.004	.008	.058	.013	.028	.006	.015	.0001
Beets	.029	.021	.353	.093	.039	.058	.016	.0006
Blackberries	.017	.021	.169	(.007)	.034	(.010)	.020	.0006
Blood (avg.)	.008	.004	.075	.261	.031	.280	.137	.0526
Blueberries	.020	.007	.051	.016	.008	.008	.011	.0009
Bluefish (See Fish)								
Bread,								
Boston brown	.129	.078	(.232)	(.394)	.185	(.607)	.201	(.0030)
"entire wheat"	(.05)	(.05)	(.208)	(.394)	(.175)	(.607)	(.120)	(.0016)
graham	(.05)	(.05)	(.291)	(.394)	(.218)	(.607)	.150	(.0025)
rye	.024	.039	.151	.701	.148	1.025	.104	(.0016)
white	.027	.023	.108	(.394)	.093	(.607)	.105	.0009
Breadfruit	.084	.007	.235	.027	.068	.100	.049	
Brussels sprouts	.027	.040	.375	.004	.120	.040	.194	(.0011)
Buckwheat flour	.039	.048	.130	.027	.226	.012	.071	.0012
Butter	.015	.001	.014	(.788)	.017	(1.212)	(.010)	.0002
Buttermilk	.105	.016	.151	.064	.097	.099	.026	.00025
Cabbage	.045	.015	.247	.027	.029	.024	.066	.0011
Cabbage greens	.106	.030	.512	.025	.099	.068	.173	.0018
Cantaloupe	.017	.012	.235	.061	.015	.041	.014	.0003
Capers	.122	.022	.209	.051	.062	—	—	—
Carp (See Fish)								
Carrots	.056	.021	.287	.101	.046	.036	.022	.0006
Cauliflower	.123	.014	.222	.068	.061	.050	.086	.0006
Caviar	.137	.022	.422	.874	.176	1.819	—	—
Celery	.078	.014	.316	.084	.037	.156	.022	.0005
Chard	.150	.071	.318	.086	.040	.039	.124	(.0025)
Cheese	.931	.037	.089	.606	.683	.880	.263	.0013
Cherries	.019	.016	.213	.023	.031	.014	.011	.0004
Cherry juice	.017	.011	.200	.013	.018	.003	.006	(.0003)
Chestnuts	.034	.051	.560	.065	.093	.006	.068	.0007
Chicken (See Meat)								
Chocolate	.092	(.293)	(.563)	.012	.455	(.051)	.085	(.0027)
Cider	.008	.011	.095	.020	.009	.006	.006	(.0002)
Citron	.121	.018	.210	.011	.033	.003	.020	—

Continued

Food	Calcium (Ca)	Magnesium (Mg)	Potassium (K)	Sodium (Na)	Phosphorus (P)	Chlorine (Cl)	Sulphur (S)	Iron (Fe)
Clams, round	.106	.098	.131	.705	.046	1.220	.224	—
soft, long	.124	.079	.212	.500	.122	.910	.213	—
Cocoa	.112	.420	.900	.059	.709	.051	.203	.0027
Coconut, dried	.059	.059	.597	.073	.155	.239	(.056)	—
fresh	.024	.020	.300	.036	.074	.120	.028	—
Coconut milk	.020	.009	.144	—	.010	—	.008	—
Cod (See Fish)								
Corn (maize) mature	.020	.121	.339	.036	.283	.045	.151	.0029
meal	.018	.084	.213	.039	.190	.146	.111	.0009
sweet	.006	.033	.113	.040	.103	.014	.046	.0008
sweet, dried	.021	.121	.414	.146	.376	.050	.167	.0029
Cotton-seed meal	.265	.462	1.390	.234	1.193	.037	.485	—
Cowpeas	.100	.208	1.402	.161	.456	.040	.240	—
Crackers	.022	.011	.100	(.594)	.102	(.910)	.125	.0015
Cranberries	.018	.007	.077	.010	.013	.009	.007	.0006
Cream	.086	.010	.126	.035	.067	.080	.030	.00022
Cucumbers	.016	.009	.140	.010	.033	.030	.020	.0002
Currants, dried	.082	.044	.873	.081	.195	.060	.044	(.0025)
fresh	.026	.017	.211	.007	0.38	.006	.014	.0005
Currant juice	.021	.010	.185	(.006)	.018	.004	.005	—
Dandelion	.105	.036	.461	.168	.072	.099	.017	.0027
Dates	.065	.069	.611	.055	.056	.228	.070	.0030
Duck (See Meat)								
Eggplant	.011	.015	(.140)	(.010)	.034	.024	.016	.0005
Eggs	.067	.011	.140	.143	.180	.106	.195	.0030
Egg white	.015	.010	.160	.156	.014	.155	.216	.0001
Egg yolk	.137	.016	.115	.075	.524	.094	.166	.0086
Endive	.104	.013	.380	.109	.038	.167	.035	—
Farina	.021	.025	.120	.065	.125	.076	.155	.0008
Figs, dried	.162	.071	.964	.046	.116	.043	.056	.0030
fresh	.053	.022	.303	.012	.036	.014	.010	—
Fish [1]								
Flaxseed	.204	.252	.901	.050	.627	.022	.170	—
Flour, buckwheat	.010	.048	.130	.027	.176	.012	.071	.0012
"entire wheat"	.031	(.090)	(.274)	(.037)	.238	(.070)	(.180)	.0025
graham	.039	(.133)	(.457)	(.037)	.364	(.070)	.183	.0037
white	.020	.018	.115	.060	.092	.074	.177	.0010
rye	.018	.081	.463	.019	.289	.055	.123	.0013
Fowl (See Meat)								
Gluten feed	.247	.221	.250	.420	.542	.090	.558	—
Goose (See Meat)								
Gooseberries	.035	.014	.197	.038	.031	—	.011	.0005
Grapefruit	.021	.009	.161	.004	.020	.005	.010	.0003
Grapejuice	.011	.009	.106	.005	.011	.002	.009	.0003
Grapes	.019	.010	.197	.015	.031	.005	.024	.0003
Guava	.014	.008	.384	—	.030	.045	—	—
Haddock (See Fish)								
Halibut (See Fish)								
Ham (See Meat)								
Hazelnuts	.287	.140	.618	.019	.354	.067	.198	.0041
Herring (See Fish)								

[1] Average fish is estimated to contain per 100 grams of protein as follows: 0.109 gram Ca; 0.133 gram Mg; 1.671 grams K; 0.373 gram Na; 1.148 grams P; 0.528 gram Cl; 1.119 grams S; 0.0055 gram Fe.

Continued

Food	Calcium (Ca)	Magnesium (Mg)	Potassium (K)	Sodium (Na)	Phosphorus (P)	Chlorine (Cl)	Sulphur (S)	Iron (Fe)
Hominy	.011	.058	.174	.020	.144	.046	(.136)	(.009)
Honey	.004	.018	.386	.001	.019	.029	.001	.0007
Horseradish	.096	.039	.468	.062	.076	.016	.190	—
Huckleberries	.020	.007	.051	.016	.008	.008	.011	.0009
Huckleberry wine	.009	.004	.042	.006	.004	.001	.006	—
Jam [1]								
Jelly	.014	(.010)	(.100)	(.013)	.008	(.004)	(.007)	(.0003)
Kohl-rabi	.077	.030	.370	.050	.071	.053	.057	.0006
Lamb (See Meat)								
Leeks	.058	.014	.199	.081	.006	.024	.072	—
Lemons	.036	.007	.175	.004	.022	.002	.011	.0006
Lemon juice	.024	.010	.127	.009	.010	.003	.006	—
Lemon, sweet	.030	.006	.442	—	.042	.013	.016	—
Lentils, dry	.107	.101	.877	.062	.438	.050	.277	.0086
Lettuce	.043	.017	.339	.027	.042	.074	.014	.0007
Limes	.055	.014	.350	.062	.036	.039	.010	—
Lime juice	—	—	—	—	—	—	.003	—
Linseed meal	.413	.432	1.083	.251	.741	.085	.396	—
Lupins, dry	.191	.191	.840	.073	.520	.034	—	—
Macaroni	.022	.037	.130	.008	.144	.073	.172	.0012
Mackerel (See Fish)								
Mamey	.009	.012	.345	—	.028	.140	—	—
Mango	.021	.007	.235	—	.017	.019	.013	—
Mangolds	.026	.030	.334	.071	.038	.082	.026	—
Maple syrup	.107	.034	.208	.010	.013	(.010)	(.005)	(.003)
Meat [2]								
Meat extract, solid	.085	.363	7.347	2.394	2.800	3.117	—	—
Meat peptone	.025	.124	2.440	.641	1.130	.561	.222	—
Milk (cow's), whole	.120	.012	.143	.051	.093	.106	.034	.00024
(cow's), skimmed	(.122)	(.012)	(.149)	(.052)	(.096)	(.110)	(.035)	.00025
(cow's), condensed	(.300)	(.032)	(.374)	(.134)	.235	(.280)	(.090)	.0006
buffalo	.203	.016	.099	.038	.125	.062	—	—
camel's	.143	.021	.114	.019	.098	.105	—	—
goat's	.128	.013	.145	.079	.103	.014	.037	—
human	.034	.005	.047	.010	.015	.035	—	—
mare's	.083	.007	.081	.010	.054	.029	—	—
sheep's	.207	.008	.187	.030	.123	.071	—	—
Millet	.014	.167	.290	.085	.327	.019	—	—
Molasses	.211	.068	1.349	.019	.044	.317	.129	.0073
Mushrooms	.017	.016	.384	.027	.108	.021	.051	—
Muskmelon	.017	.012	.235	.061	.015	.041	.014	.0003
Mustard	.492	.260	.761	.056	.755	.016	1.230	—
Mutton (See Meat)								
Oatmeal	.069	.110	.344	.062	.392	.069	.202	.0038
Okra	.071	.010	.035	.043	.019	—	—	—
Olives	.122	.002	1.526	.128	.014	.004	.027	.0029
Onions	.034	.016	.178	.016	.045	.021	.070	.0006
Oranges	.045	.012	.177	.012	.021	.006	.011	.0002

[1] The percentages of the ash constituents in jams are believed to average about two-thirds those of the corresponding fruits.

[2] Average meat is estimated to contain per 100 grams protein as follows: 0.058 gram Ca; 0.118 gram Mg; 1.694 grams K; 0.421 gram Na; 1.078 grams P; 0.378 gram Cl; 1.146 grams S; 0.0150 gram Fe.

Continued

Food	Calcium (Ca)	Magnesium (Mg)	Potassium (K)	Sodium (Na)	Phosphorus (P)	Chlorine (Cl)	Sulphur (S)	Iron (Fe)
Orange juice	.029	.011	.182	.008	.016	.003	.009	.0002
Oysters	.052	.037	.091	.459	.155	.590	.187	.0045
Paprika	.229	.164	2.075	.178	.341	.155	—	—
Parsnips	.059	.034	.518	.004	.076	.030	.036	.0006
Peaches	.016	.010	.214	.022	.024	.004	.009	.0003
dried	.034	.056	(.830)	.082	.146	—	.212	(.0012)
Peanuts	.071	.180	.654	.050	.399	.056	.224	.0020
Pears	.015	.011	.132	.016	.026	.011	.010	.0003
Pear juice	.009	.008	.140	—	.011	—	.009	—
Peas, dried	.084	.149	.903	.104	.400	.035	.219	.0057
fresh	.028	.038	.285	.013	.127	.024	.063	.0017
Pecan nuts	.089	.152	(.332)	—	.335	.050	.113	.0026
Pepper, green, fresh	.006	.010	(.139)	—	.026	.013	.014	.0004
Pepper, black, dry	.440	.156	1.140	.131	.188	.312	—	—
Pepper, white, dry	.425	.113	—	—	.233	.029	—	—
Perch (See Fish)								
Persimmons	.022	.009	.292	.011	.021	.002	.005	—
Pineapple	.018	.011	.321	.016	.028	.051	.009	.0005
Plums	.020	.011	.203	.019	.032	.002	.009	.0005
Pomegranate	.011	.005	.063	.085	.105	.003	—	.0004
Pork (See Meat)								
Potatoes	.014	.028	.429	.021	.058	.038	.030	.0013
sweet	.019	.028	.397	.039	.045	.094	.024	.0005
Prunes, dried	.054	.055	1.030	.069	.105	.017	.037	.0030
Pumpkin	.023	.008	(.320)	.065	.059	—	.021	(.0008)
Radishes	.021	.012	.218	.069	.029	.054	.041	.0006
Raisins	.064	.083	.820	.133	.132	.082	.051	.0021
Raspberries	.049	.024	.173	—	.052	—	.017	.0006
Raspberry juice	.021	.016	.134	.005	.012	—	.009	—
Rhubarb	.044	.017	.325	.025	.031	.036	.013	.0010
Rice, brown	—	—	—	—	.207	—	—	.0020
white	.009	.033	.070	.025	.096	.054	.117	.0009
Romaine (salad)	.045	.032	.306	.016	.053	.073	.019	—
Rutabagas	.074	.018	.399	.083	.056	.058	.083	—
Rye, entire	.055	.130	.453	.035	.385	.025	.170	.0039
(See also Bread and Flour)								
Salmon (See Fish)								
Sapato	.026	.008	.179	—	.006	.087	—	—
Shredded wheat	.041	.144	—	—	.324	—	—	.0045
Shrimp	.096	—	—	—	—	—	—	—
Soup, canned	.036	—	.033	—	.030	—	—	—
canned vegetable	.025	.013	.101	—	.038	—	.025	—
Spinach	.067	.037	.774	.125	.068	.074	.038	.0036
Squash, summer, seeds removed	.018	.008	.150	.002	—	—	—	(.0006)
with seeds	.024	.012	.180	.004	—	—	—	(.0006)
Squash, winter	.019	.011	.320	.004	—	—	—	(.0006)
Strawberries	.041	.019	.147	.050	.028	.006	.014	.0008
Tamarind	.007	.021	—	—	.072	.007	.009	—
Tapioca	.023	—	—	—	.090	.018	.029	.0016
Tomatoes	.011	.010	.275	.010	.026	.034	.014	.0004
Tomato juice	.006	.010	.310	.015	.015	.055	—	—
Truffles	.024	.018	.404	.077	.062	.039	—	—
Turnips	.064	.017	.338	.056	.046	.041	.065	.0005

Continued

Food	Calcium (Ca)	Magnesium (Mg)	Potassium (K)	Sodium (Na)	Phosphorus (P)	Chlorine (Cl)	Sulphur (S)	Iron (Fe)
Turnip tops	.347	.028	.307	.082	.049	.168	.069	—
Veal (See Meat)								
Vinegar (cider)	.016	.008	.165	—	.013	—	.017	(.0003)
Walnuts	.089	.134	(.332)	—	.358	.040	.172	.0021
Water cress	.187?	.034	.287	.099	.005	.061	.167	
Watermelon	.011	.003	.073	.008	.003	.008	.007	.0019
Wheat, entire	.045	.133	.473	.039	.423	.068	.181	.0050
(See also Bread and Flour)								
Wheat bran	.120	.511	1.217	.154	1.215	.090	.247	.0078
Wheat germ	.071	.342	.296	.722	1.050	.070	.325	—
Wheat gluten	.078	.045	.007	.028	.200	.050	.920	—
Whey	.044	.008	.157	.038	.035	.119	.009	?
Whortleberries,								
entire	.031	.021	.261	.021	.042	—	—	—
flesh only	.020	.011	.087	—	.018	—	—	—
Wine (avg.)	.009	.010	.104	.008	.015	.011	.015	(.0003)

Protein, Calcium, Phosphorus, and Iron in Grams per 100 Calories of Food Material

(Estimated from data compiled from various sources)

Food	Protein	Calcium (Ca)	Phosphorus (P)	Iron (Fe)	CaO	P_2O_5
	Grams	Grams	Grams	Grams	Grams	Grams
Almonds	3.22	.037	.072	.00060	.052	.165
Apples	0.64	.012	.020	.00048	.016	.045
Apricots	1.90	.023	.044	.00052	.033	(.100)
Asparagus	8.10	.122	.177	.00451	.171	.405
Bacon (See Meat)						
Bananas	1.32	.009	.031	.00061	.012	.072
Beans, dried	6.52	.047	.137	.00203	.065	.314
kidney	5.83	(.040)	(.143)	(.00216)	(.056)	(.326)
Lima	5.80	.020	.096	.00200	.028	.221
string	5.55	.110	.126	.00265	.154	.289
Beef (See Meat)						
Beer	—	.008	.061	.00217	.011	.140
Beets	3.47	.064	.084	.00130	.089	.193
Blackberries	2.25	.029	.058	.00104	.042	.133
Blueberries	(0.8)	(.027)	(.011)	(.0012)	(.038)	(.025)
Bluefish (See Fish)						
Bread, Boston brown	2.64	.056	.082	(.0013)	.079	.187
"entire" wheat	3.95	(.020)	.071	(.00065)	(.028)	(.163)
graham	3.42	(.020)	.084	(.00096)	(.028)	(.192)
rye	3.54	.009	.058	.00039	.013	.133
white	3.50	.011	.035	.00035	.015	.081
Brussels sprouts	(7.30)	(.086)	(.380)	(.00349)	(.121)	(.870)
Buckwheat flour	1.85	.011	.065	.00034	.015	.148

Continued

Food	Protein	Calcium (Ca)	Phosphorus (P)	Iron (Fe)	CaO	P_2O_5
	Grams	Grams	Grams	Grams	Grams	Grams
Butter	0.13	.002	.002	.00003	.003	.005
Buttermilk	8.40	.294	.271	.00070	.411	.621
Cabbage	5.07	.143	.092	.00349	.200	.210
Cantaloupe	1.51	.044	.038	.00071	.061	.088
Carp (See Fish)						
Carrots	2.42	.124	.101	.00133	.173	.232
Cauliflower	5.90	.403	.200	.00197	.564	.459
Celery	1.28	.421	.201	.00270	.589	.460
Chard	8.37	.393	.105	(.00655)	.550	.240
Cheese	6.05	.212	.156	.00030	.297	.357
Cherries	1.20?	.025	.039	.00051	.035	.090
Chestnuts	2.55	.014	.044	.00029	.019	.088
Chicken (See Meat)						
Chocolate	2.11	.015	.075	(.00044)	.021	.171
Citron	0.15	.037	.010	.00099	.052	.023
Clams, long	19.82	.285	.282	(.00970)	.399	.645
round	14.01	.229	.100	(.00970)	.321	.228
Cocoa	4.35	.023	.143	.00054	.032	.327
Coconut	0.95	.006	.018	(.00030)	.009	.041
Cod (See Fish)						
Corn	3.06	.006	.102	.00079	(.008)	(.233)
Corn meal	2.59	.005	.053	.0003	.007	.121
Cotton-seed meal	12.80	.066	.298	—	.092	.682
Cowpeas	6.20	.029	.132	—	.041	.303
Crackers, "soda"	2.37	.006	.025	.00036	.008	.057
Cranberries	0.85	.039	.027	.00129	.054	.062
Cream, 18.5 per cent fat	1.27	.050	.044	.0001	.072	.100
40 per cent fat	0.58	.020	.020	.00005	.032	.045
Cucumbers	4.60	.090	.191	.00115	.126	.437
Currants, dried (Zante)	0.75	.026	.061	.00087	.036	.139
fresh	2.62	.045	.066	.00087	.063	.150
Dandelion greens	3.93	.172	.117	.0044	.241	.269
Dates	0.60	.019	.016	.00086	.026	.037
Duck (See Meat)						
Eggplant	4.30	.041	.122	.00184	.057	.280
Eggs	9.05	.045	.122	.00205	.063	.279
Egg white	24.12	.020	.022	.00020	.028	.050
Egg yolk	4.32	.036	.118	.00230	.050	.270
Farina	3.05	.006	.035	.00022	.008	.079
Figs	1.35	.051	.037	.00095	.072	.084
Fish (See footnote on page 423)						
Flour, buckwheat	1.84	.011	.065	.00034	.015	.148
"entire" wheat	3.85	.009	.066	.0007	.012	.152
graham	3.71	.011	.101	.00100	.015	.232
white (wheat)	3.20	.006	.026	.00023	.008	.060
rye	1.95	.005	.082	.00037	.007	.188
Fowl (See Meat)						
Goose (See Meat)						
Grapefruit	1.15	.040	.036	.00058	.056	.083
Grapes	1.35	.019	.032	.00031	.027	.074
Grapejuice	0.35	(.011)	.011	.0003	.015	.025
Haddock (See Fish)						
Halibut (See Fish)						
Ham (See Meat)						

Continued

Food	Protein	Cal-cium (Ca)	Phos-phorus (P)	Iron (Fe)	CaO	P_2O_5
	Grams	Grams	Grams	Grams	Grams	Grams
Hazelnuts	—	.041	.050	.00057	.057	.115
Herring (See Fish)						
Hominy	2.35	.002	.027	.00025	.002	.063
Honey	0.12	.002	.006	.0003	.002	.013
Huckleberries	0.82	.027	.011	.0012	.038	.025
Kohl-rabi	6.48	.249	.186	.00194	.349	.426
Lamb (See Meat)						
Lemons	2.25	.081	.049	.00135	.113	.112
Lemon juice	—	.060	—	—	.084	.059
Lentils	7.37	.031	.126	.00247	.043	.288
Lettuce	6.27	.224	.224	.00785	.314	.513
Linseed meal	—	—	—	—	—	—
Lupins	—	—	—	—	—	—
Macaroni	3.70	.006	.040	.00033	.008	.092
Mackerel (See Fish)						
Maple syrup	—	.037	(.003)	(.001)	.053	(.007)
Meat (See footnote on page 424)						
Milk, whole	4.75	.174	.134	.00035	.243	.308
skimmed	9.25	(.331)	.262	(.00068)	(.463)	(.600)
condensed, sweetened	2.70	(.096)	.072	(.0002)	(.135)	.165
condensed, unsweetened	5.75	.189	.146	(.0004)	(.264)	.335
Molasses	0.83	.074	.015	.00255	.102	.035
Muskmelon	1.51	.043	.038	.0008	.060	.088
Mutton (See Meat)						
Oatmeal	4.20	.017	.099	.00096	.024	.226
Olives	0.37	.041	.004	.00097	.057	.010
Onions	3.30	.069	.093	.0010	.097	.212
Oranges	1.55	.088	.040	.00039	.123	.091
Orange juice	1.44	.067	.037	.00046	.093	.082
Oysters	12.30	.106	.306	.00893	.149	.702
Parsnips	2.47	.091	.117	.0009	.128	.268
Peaches	1.70	.038	.057	.00073	.053	.130
Peanuts	4.70	.013	.073	.00036	.018	.166
Pears	0.95	.024	.041	.00047	.033	.093
Peas	6.92	.026	.120	.00035	.036	.274
Pecans	1.30	.012	.045	.00165	.017	.104
Pepper, green	4.59	.034	.145	.00222	.047	.333
Perch (See Fish)						
Persimmons	—	—	—	—	—	—
Pineapple, fresh	0.92	.041	.064	.00116	.058	.146
Plums	1.20	.024	.038	.00059	.033	.087
Pork (See Meat)						
Potatoes	2.65	.016	.069	.00156	.023	.158
sweet	1.45	.016	.037	.00041	.023	.084
Prunes	0.70	.018	.035	.00100	.025	.080
Pumpkin	3.90	.089	.229	(.00130)	.125	.525
Radishes	4.42	.073	.098	.00205	.102	.225
Raisins	0.75	.019	.038	.00139	.026	.088
Raspberries	2.57	.074	.078	.00091	.104	.178
Rhubarb	2.60	.189	.134	.00433	.264	.307
Rice, brown	2.52	(.003)	.060	.00058	(.004)	.138
white	2.27	.001+	.027	.00026	.003	.063
Rutabagas	3.15	.185	.140	—	.259	.322
Rye, entire	—	—	—	—	—	—

Continued

Food	Protein	Calcium (Ca)	Phosphorus (P)	Iron (Fe)	CaO	P_2O_5
	Grams	Grams	Grams	Grams	Grams	Grams
Salmon (See Fish)						
Shredded wheat	3.50	.011	.089	.00123	.016	.203
Spinach	8.79	.281	.285	.01506	.393	.653
Squash, summer	3.05	.039	.035	(.0013)	.054	.080
winter	3.10	.040	.061	(.0013)	.056	.139
Strawberries	2.56	.104	.072	.00205	.146	.164
Tapioca	0.11	.004	.025	.00045	.006	.058
Tomatoes	3.95	.050	.113	.00175	.070	.259
Turnips	3.30	.161	.117	.00127	.226	.269
Turnip tops	—	—	—	—	—	—
Veal (See Meat)						
Vinegar (cider)	—	.111	.090	.00213	.156	.206
Walnuts, California or English	2.60	.013	.015	.00030	.018	.116
Water cress	—	—	—	—	—	—
Watermelon	1.32	.038	.010	(.00099)	.053	.023
Wheat, entire	3.63?	.013	.118	.00140	.018	.270
Wheat, germ	—	—	—	—	—	—
Wheat gluten	—	—	—	—	—	—
Whey	3.74	.165	.131	?	.231	.300
Whortleberries	—	—	—	—	—	—
Wine (average, 10 per cent alcohol)	—	.011	.021	.00167	.016	.047

legumes, asparagus, cauliflower, lettuce, grapes, and of various grains contains varying amounts of manganese.

Silica.—This element is eliminated in the hair and desquamated epithelium. It is present in many vegetables, but the part played in the animal economy is unknown.

Arsenic.—Gautier has demonstrated the presence of a trace of arsenic in the ectodermic tissues, the skin, hair, brain, mammary gland, and thyroid. Smaller traces have been demonstrated in other organs. The rôle of arsenic in metabolism is unknown. Traces of arsenic have been found in certain vegetables, as cabbage and turnips, as well as in some cereals. Common salt may contain some arsenic, and it is sometimes present in foods either as an adulterant or as a food poison. (See same.)

Calcium Metabolism.—Calcium is taken into the body in organic forms, as in milk, yolk of egg, and cereals, and as inorganic salts chiefly in drinking water, as carbonates, sulphates, and phosphates. Both forms are absorbable, but this depends largely on what salts are taken with it. Sodium chlorid, for example, increases the absorption, while the presence of alkalis decreases it. There are various estimates as to the amount of calcium needed to protect the calcium in the body, but for the individual of average size the ingestion of from 1 to 1.5 gm. of calcium oxide should suffice, as absorption of calcium is imperfect. This allows for the estimated 0.65 gm. CaO needed daily. Children need more, and this subject is gone into under

Infant Feeding; pregnant women need more (see same). This subject is also mentioned under Diet and the Teeth and in Rickets. Five to 10 per cent. of that taken is excreted in the urine, while the remainder is found in the feces, whether unabsorbed or absorbed, and then eliminated in the intestine. The calcium excretion in the urine may be increased by increase in the ingestion of water, by the administration of dilute hydrochloric acid, and very largely increased by the administration of lactic acid and sodium lactate. It is also increased in bodily rest. There is a loss of lime over that taken into the body in osteomalacia, in pernicious anemia, in advanced tuberculosis and in diabetes, and there is a deficient excretion, and the lime is retained in the body in arteriosclerosis. If the diet given is deficient in calcium, the loss will exceed the intake. If the diet contains excessive amounts of calcium, some of the lime will be retained in the body, and is apparently stored up in the bones, and may not produce any symptoms. Foods particularly low in calcium content are white bread, grapes, butter, chicken, and roast beef. In the article on Oxaluria will be found lists of various foods with the calcium content given.

Calcium metabolism is disturbed in tetany, spasmophilia, and rickets. (See same.)

SALT METABOLISM AND DISEASE

The tissues differ in their salt composition, and changes in salt metabolism are probably due either to atrophy or growth of certain organs or tissues, or to their taking on new functions, or to the processes of disease. Studies of the balances of the various salts have been made but sparingly in disease, and doubtless this subject will be taken up more energetically in the future. In hunger, Wellman found that there was a greater loss of salt than could be accounted for by the metabolism of the fleshy parts. The principal excess was phosphoric pentoxid and calcium and magnesium oxid in about the same proportion as is found in bone, and the skeletons of the animals were found to have actually lost 6 or 7 per cent. of their weight. There is a lowered calcium excretion in many diseased conditions, among which may be mentioned, pleural effusion, pneumonia, delirium tremens, and various fevers. In pulmonary tuberculosis Senator found that there was an excess of calcium excreted. In osteomalacia the calcium balance is disturbed, and more is excreted than is taken into the body. Phosphoric acid lessens the calcium excreted, and this might be used in experimental therapeutics. Castration, which has been done in a few cases, restores the CaO_2 equilibrium, and there is also a tendency to restoration of the sulphur equilibrium. On the other hand, in myositis ossificans the amount of calcium excreted in the urine is lower than normal. There is also a retention of lime salts in arthritis deformans. In endarteritis the calcium excretion is interfered with, and Rumpf claims to have

obtained good results by giving salts which aid the excretion of calcium as lactic acid, sodium lactate, sodium citrate, sodium carbonate, and sodium chlorid.

The table below, by Hoobler (Archives of Pediatrics, March, 1912), shows the mineral constituents of various common foods expressed in percentages of the total mineral ash. This table will be found of great practical use in arranging diets with a view to their salt content:

PHOSPHORUS-CONTAINING FOODS

	Contents estimated as P_2O_5.
Fruits, 15–12 per cent.	Pears, apples, citron, cherries, plums, apricots, oranges, figs.
Berries, 20–13 per cent.	Gooseberries, currants, huckleberries, strawberries.
Nuts, 43–18 per cent.	Almonds, cocoanuts, chestnuts.
Cereals, 54–17 per cent.	Rice flour, rice, wheat flour, buckwheat flour, oatmeal, oatmeal flour, barley meal, barley flour, rye flour, cornmeal, cornmeal flour, rolled oats, pearl barley, macaroni, brown bread, white bread.
Vegetables, 41–10 per cent.	Black radishes, artichokes, beans, peas, lentils, pumpkins, kohlrabi, cauliflower, asparagus, potato, cabbage, Savoy cabbage, mushrooms, onions, rhubarb, cucumbers, turnips, celery, carrots, sugar beets, radishes, spinach.
Milk, eggs, cheese, 65–26 per cent.	Egg yolk, eggs, cheese, milk.
Meats and fish, 48–20 per cent.	Veal, pickerel, pork, beef, oysters, salmon.

POTASSIUM-CONTAINING FOODS

	Contents estimated as K_2O.
Fruits, 81–35 per cent.	Olives, plums, apricots, figs, pears, cherries, pineapples, citron, oranges, apples.
Berries, 57–21 per cent.	Huckleberries, currants, gooseberries, strawberries.
Nuts, 56–28 per cent.	Chestnuts, cocoanuts, walnuts, almonds.
Cereals, 38–14 per cent	Rye flour, wheat flour, cracked wheat, rolled oats, cornmeal, cornmeal flour, hominy, barley flour, barley meal, oatmeal, buckwheat flour, oatmeal flour, rice flour, graham bread.
Vegetables, 60–16 per cent.	Potatoes, rhubarb, cucumbers, mushrooms, cabbage, turnips, celery, beans, peas, tomatoes, endives, lettuce, carrots, kohlrabi, lentils, radishes, Savoy cabbage, onions, artichokes, asparagus, cauliflower, pumpkins, blood beets, spinach.
Milk, eggs, cheese, 31–13 per cent.	Egg whites, milk, eggs, cheese.
Meats and fish, 48–24 per cent.	Beef, pork, veal, salmon, pickerel.

SODIUM-CONTAINING FOODS

	Contents estimated as Na_2O.
Fruits, 26–7 per cent.	Apples, oranges, apricots, pineapples, pears, olives.
Berries, 28–9 per cent.	Strawberries, gooseberries.
Cereals, 40–14 per cent.	Macaroni, barley flour, brown bread, white bread, graham bread.
Vegetables, 48–7 per cent.	Blood beets, spinach, carrots, pumpkin, radishes, asparagus, tomatoes, lentils, endives, cauliflower, turnips, sugar beets, artichokes, lettuce, Savoy cabbage.
Milk, eggs, cheese, 31–8 per cent.	Egg whites, eggs, milk.
Meats and fish, 30–8 per cent.	Oysters, pickerel, salmon.

IRON-CONTAINING FOODS

Contents estimated as Fe_2O_3.

Fruits, 2–1 per cent.	Figs, pineaples, apples, pears, plums.
Berries, 5–1 per cent.	Strawberries, gooseberries, huckleberries.
Nuts, 1.8–1.3 per cent.	Cocoanuts, walnuts.
Cereals, 2–1 per cent.	Rye flour, barley meal, barley flour, rice, buckwheat flour, cornmeal, corn flour, rice flour, wheat-wheat flour, graham flour.
Vegetables, 5.3–1 per cent.	Lettuce, onions, asparagus, endives, kohlrabi, pumpkins, artichokes, tomatoes, lentils, black radishes, celery, rhubarb, potatoes, mushrooms, beets.

SULPHUR-CONTAINING FOODS

Contents estimated as SO_3.

Fruits, 6 per cent.	Apples, pears.
Berries, 6 per cent.	Gooseberries.
Cereals, 14–13 per cent.	White bread, brown bread.
Vegetables, 30–5 per cent.	Black radishes, mushrooms, cauliflower, turnips, kohlrabi, cabbage, spinach, carrots, cucumbers, potatoes, asparagus, onions, celery, endives, artichokes.

CHLORINE-CONTAINING FOODS

Contents estimated as Cl.

Fruits, 10 per cent.	Pineapples.
Nuts, 14 per cent.	Cocoanuts.
Cereals, 30–5 per cent.	White bread, brown bread, macaroni, oatmeal.
Vegetables, 16–5 per cent.	Celery, potatoes, cucumbers, radishes, Savoy cabbage, lettuce, asparagus, tomatoes, cabbage, spinach, beets, rhubarb, turnips, kohlrabi, carrots.
Milk, eggs, cheese, 28–7 per cent.	Egg whites, milk, eggs, cheese.
Meats and fish, 21–5 p. c.	Salmon, oysters, pickerel.

MAGNESIUM-CONTAINING FOODS

Contents estimated as MgO.

Fruits, 8–5 per cent.	Apples, pineapples, oranges, figs, pears, citron, cherries, plums.
Berries, 6–5 per cent.	Currants, huckleberries, gooseberries.
Nuts, 18–6 per cent.	Almonds, walnuts, chestnuts, cocoanuts.
Vegetables, 9–5 per cent.	Tomatoes, sugar beets, peas, cauliflower, kohlrabi, lettuce, spinach, celery, carrots, onions.
Cereals, 16–5 per cent.	Corn, cornmeal, wheat, wheat flour, barley meal, buckwheat, rice, rice flour, rye flour, oatmeal, rolled oats, graham bread.
Meats and fish, 9–5 p. c.	Salmon, pork.

CALCIUM-CONTAINING FOODS

Contents estimated as CaO.

Fruits, 30–7 per cent.	Citron, oranges, pineapples, figs, pears, cherries, olives.
Berries, 14–8 per cent.	Strawberries, gooseberries, currants, huckleberries.
Nuts, 9–8 per cent.	Almonds, walnuts.
Cereals, 8–7 per cent.	Oatmeal, cornmeal, wheat flour.
Vegetables, 27–5 per cent.	Savoy cabbage, cauliflower, onions, lettuce, radishes, celery, cabbage, endives, spinach, asparagus, carrots, kohlrabi, turnips, rhubarb, artichokes, pumpkin, lentils, cucumbers, tomatoes, beans.
Milk, eggs, cheese, 35–8 per cent.	Cheese, milk, egg yolks, eggs.
Meat and fish, 18–7 p. c.	Oysters, salmon, pickerel, pork.

BEVERAGES AND STIMULANTS

WATER

Water is the chief constituent of all beverages, and also enters largely into the composition of solid food. The human body itself is composed of about 60 per cent. of water. While man can live for weeks without food, he can abstain from water for but a few days. Water is absolutely necessary as a solvent, and as it is constantly being eliminated by the skin, lungs, and kidneys, this loss must be replaced by some means in order to maintain the functions of the body. This is most conveniently done through the agency of the various beverages. The best method, however, of replenishing the water-supply is that of drinking the water in its pure state, when it retains all its solvent properties. Some waters are taken for their laxative or purgative action, and others for the salts which they contain.

The amount of water consumed daily by the average person is from six to eight glasses. This varies, however, with the amount and variety of food and exercise taken. The age, sex, and size of the individual and the season of the year also influence the total daily consumption of water. In very warm weather, for example, and under severe physical strain, much water that would not be lost in the cold season of the year is eliminated in the form of perspiration and must be compensated for.

Water is absorbed chiefly in the intestine; a small amount is absorbed in the stomach, and but a very trifling amount, if any, in the mouth. The water absorbed in the intestine is passed into lymphatics, and carried on into the circulation, whence it is eliminated. Thus by removing the water from the blood and sending it through the kidneys into the bladder, space is made in the circulation for the entrance of more fluid from the alimentary tract.

As previously stated, water is eliminated through the skin, kidneys, lungs, and feces. The amount of water excreted daily varies greatly under special conditions. In cold weather the skin is inactive and the kidneys excrete a greater amount of water than in hot weather, when the sweat-glands functionate more actively. When there is a tendency toward liquid movements from the bowel, the elimination by the kidneys is lessened. In warm weather elimination by the lungs is stimulated.

The temperature of drinking-water is a matter of some importance. Iced water will stimulate a more rapid and a greater secretion of gastric juice, but lessens the motility of the stomach. Iced water in excess is injurious, and should not be taken when one is overheated. Hot water has a very beneficial effect on an irritated stomach.

Water is a most valuable diuretic and diaphoretic. When the stomach can not retain it, it is often given by the rectum. A pint of salt solution, if injected by the use of a rectal tube, will, if the colon has previously been emptied, be retained long enough to be absorbed. If a half-pint or even a pint of salt solution be introduced under the skin, it will be absorbed rapidly and as rapidly be eliminated. This is one of the most useful measures for producing rapid elimination through the kidneys.

According to the amount of mineral water they contain waters are classed as hard and soft. Rain-water is soft, and is the purest form of natural water. The hardness of water is due to earthy carbonates; by boiling, the carbonic acid gas is driven off and the carbonates are precipitated, and the water thus rendered more suitable as a beverage. Boiling has the additional advantage that it destroys most of the micro-organisms that may be present in the water.

Water often contains impurities, such as lime, magnesia, iron, and other salts, or micro-organisms, and it often becomes necessary to purify it for drinking purposes. Typhoid fever and cholera are communicated chiefly through the agency of polluted drinking-water. The best method of purification is by distillation, by which means both inorganic and organic impurities can be removed or rendered innocuous. This method is now used largely on ships. When distilled and aërated, sea-water makes a most pleasant beverage. Water may also be purified by means of filtration, charcoal and sand being used extensively for this purpose. Porcelain cylinders are also in common use. Whatever the filtering agent employed, unless it be kept clean it is liable to become a source of contamination rather than of purification. Owing to the fact that soluble impurities often pass through the filter, filtered water is not nearly so reliable as distilled water. A very economic and convenient method of purifying water is to dissolve one gram of alum in a little water and pour this solution into one gallon of the water to be purified. After standing for twenty-four hours the impurities will be precipitated.

MINERAL WATERS

Mineral waters are frequently taken as substitutes for ordinary water; at times they produce a most marked stimulating effect on various organs. Their efficiency is greatly enhanced when a "drinking cure" is combined with proper dietetic regulations. Mineral waters differ from ordinary waters in the greater amount of gaseous and solid matters they contain. The gaseous constituents of mineral waters are mainly carbon dioxid and sulphuretted hydrogen. The solid constituents are salts of sodium, potassium, magnesium, aluminum and calcium, iron, iodin, bromin, chlorin, and sulphur. Taken before meals, waters containing carbonic acid have a soothing effect on an irritated stomach. Taken in excess, all carbonated waters are apt to produce indigestion.

Some waters have a purgative effect, others a laxative, and still others diuretic. Thermal waters issue hot from springs, their virtue being due to their heat. Some mineral waters have no medicinal virtue whatever, and are utilized merely as drinking-water.

Radio-active Water.—Certain mineral waters are now known to contain traces of radium, and some of the therapeutic effects of these waters have been attributed to their radio-activity. The radio-activity is quickly dissipated, however, upon exposure to the air, and on this account this property is largely lost by transportation. Such waters as Carlsbad, Kissingen, Aresbaden, Hot Springs (Arkansas) have been recognized as being radio-active. While radio-active waters can be artificially prepared, this property is quickly lost by exposure to the air.

Classification of Mineral Waters.—The following classification and description of mineral waters are taken from Cohen's Physiologic Therapeutics, vol. ix., p. 416 (Kisch, Hinsdale, and Peale):

I.	Alkaline mineral waters:	Simple acidulous. Alkaline acidulous. Alkaline muriated acidulous. Alkaline saline acidulous.
II.	Sodium chlorid waters:	Simple sodium chlorid. Sodium chlorid with iodin and bromin. Saline water or brine (Soolen).
III.	Bitter waters.	
IV.	Sulphurous waters.	
V.	Iron waters:	Carbonated iron waters. Sulphurated iron waters. Iron and arsenic waters.
VI.	Earthy mineral waters.	
VII.	Acratothermal waters.	

I. **Alkaline Mineral Waters.**—These waters are divided into: (1) Simple acidulous waters; (2) alkaline acidulous waters; (3) alkaline muriated acidulous waters; and (4) alkaline saline-acidulous waters. The simple acidulous waters are those that contain large amounts of carbon dioxid; this ingredient increases the peristaltic action of the stomach and intestine. These waters are utilized largely in the treatment of minor gastric disturbances and in catarrhal conditions of the respiratory tract. Among the most important of these waters are: Apollinaris water; the Dorotheenquelle, at Carlsbad; the Geyser Spring in California; and the Manitou Soda Spring in Colorado.

Alkaline Acidulous Waters.—These waters contain, in addition to large quantities of carbon dioxid, varying proportions of sodium carbonate. In moderate quantities they stimulate the activity of the gastro-intestinal tract, the respiratory, and the urinary organs. They dissolve mucus and neutralize the excess of acid in the stomach.

The following table[1] gives the chemic composition (in 1 liter) of the most important alkaline acidulous waters:

[1] Taken from Cohen's Physiologic Therapeutics, vol. ix., p. 420.

	Grams.
Bilin, of sodium bicarbonate	3.31
Fachingen, of sodium bicarbonate	3.57
Neuenahr, of sodium bicarbonate	1.09
Salzbrunn, of sodium bicarbonate	2.15
Salvator Springs, of sodium bicarbonate	0.30
Vals, of sodium bicarbonate	7.28
Vichy, of sodium bicarbonate	4.88
Bladon (Vichy), of sodium bicarbonate	0.80
California Seltzer, of sodium bicarbonate	0.90
Idan-ha, of sodium and magnesium bicarbonates	1.20
Napa Soda (Pagoda), of sodium and magnesium carbonates and bicarbonates	0.70
Saratoga (Vichy), of sodium bicarbonate	1.42
Saratoga (Vichy), of calcium and magnesium bicarbonates	2.35

Alkaline Muriated Acidulous Waters.—These waters contain, in addition to sodium carbonate and carbon dioxid, large quantities of sodium chlorid. They exert a markedly solvent effect on uric acid, and liquefy the secretions from the respiratory tract. They are especially useful in catarrhal conditions of the respiratory tract, such as chronic bronchitis, and in chronic catarrh of the stomach, of the biliary passages, and of the urinary organs. They are used for gargling and inhalation purposes, and also for baths. To this class belong the waters of Royat, Ems, Selters, and Saratoga Vichy.

The chemic composition (in 1 liter) of the most important alkaline muriated acidulous waters is shown by the following table: [1]

	Sodium carbonate. *Grams.*	Sodium bicarbonate. *Grams.*	Sodium chloride. *Grams.*
Æetna	1.25	..	0.41
Assmannshausen	1.25	0.13	1.57
Azule	1.0	0.13	1.56
Ems	1.0	2.03	1.00
Gleichenberg	1.0	2.54	1.85
Glen Alpine	1.0	0.56	0.36
Luhatschowitz	1.0	6.76	4.45
Radein	1.0	3.01	0.60
Roisdorf	1.0	1.24	1.84
Royat	1.0	1.35	1.73
Salutaris	1.0	0.08	1.40
Saratoga Vichy	1.0	1.48	2.20
Selters	1.0	1.23	2.33
Szcawanica	1.0	8.44	4.61
Weilbach	1.0	1.35	1.25

Alkaline Saline Acidulous Waters.—These waters contain sulphate in addition to bicarbonate and chlorid of sodium. They occur as both warm and cold waters. The cold waters possess a markedly diuretic effect, and when taken in large quantities act as purgatives. The warm waters diminish the urinary secretion. The cold alkaline saline waters are useful in strong individuals for reducing flesh and for the relief of constipation. The warm waters are useful in gastro-intestinal catarrh, ulcer of the stomach, gout, catarrhal jaundice, congestion of the liver, cholelithiasis, and in conditions associated with urinary concretions. Among this class of waters are to be mentioned

[1] *Ibid.*, vol. ix., p. 422.

Carlsbad, Marienbad, Elster, Keyser Spa in California, Castle Creek, Hot Springs in Arizona, Idaho Hot Springs, and Manitou Springs.

The following table[1] gives the chemic composition of important alkaline saline water; 1 liter of water contains:

At:	Sodium sulphate. Grams.	Sodium carbonate Grams.	Sodium bicarbonate. Grams.	Sodium chlorid. Grams.
Aqua de Vida (Lower Spring)	0.24	0.05	..	0.05
Bertrich	0.88	..	0.72	0.21
Carlsbad	2.40	..	1.29	1.04
Elster	5.16	..	1.68	0.82
Franzensbad	2.80	..	0.67	1.14
Geyser Spa	0.04	0.08	0.34	0.14
Manitou (Manitou Spring)	0.20	0.02	..	0.40
Marienbad	5.04	..	1.82	2.04
Rohitsch	3.02	..	1.07	0.07
Royal Gorge (Iron Duke Spring)	0.19	1.24	..	1.34
Springdale Seltzer	1.74	..	0.09	0.08
Tarasp	2.10	..	4.87	3.67

The chemic composition of the salts of Carlsbad Sprudel and Marienbad Spring on complete evaporation is as follows[2] (3 to 5 grams (45 to 80 grains) are dissolved in a glass of water when used):

	Carlsbad Sprudel salt.	Marienbad Spring salt.
Sodium sulphate	43.25 per cent.	54.38 per cent.
Sodium bicarbonate	36.29 "	23.81 "
Sodium chlorid	16.81 "	20.40 "

II. **Sodium Chlorid Waters.**—To this class belong the simple sodium chlorid waters, sodium chlorid waters containing iodin and bromin, and brine or saline waters.

Simple Sodium Chlorid Waters.—These waters contain, in addition to sodium chlorid and other chlorids, carbon dioxid in large quantities. Sodium chlorid increases the secretion of the mucous membranes, especially of the stomach. These waters have a markedly diuretic and laxative effect, and are useful in chronic catarrh of the respiratory tract, and of the stomach, intestine, and biliary passages.

The following table,[3] gives the chemic composition of simple sodium chlorid waters; 1 liter of water contains:

At:	Sodium chlorid. Grams.
Baden-Baden	2.01
Bath	0.20
Bourborne	5.80
Byron Springs (liver and kidney)	10.08
Byron Spring (Byron Surprise)	304.27
Carnstadt	2.45
Congress Saratoga Springs	6.49
Droitwich	310.00
Glenwood Springs (Yampa)	17.66
Harrogate	12.70

1 Cohen's Physiologic Therapeutics, vol. ix., p. 424.
2 *Ibid.*, vol. ix., p. 425.
3 *Ibid.*, vol. ix., p. 429.

At:	Sodium chlorid Grams.
Homburg	9.80
Kissingen	5.82
Kronthal	3.54
Liberty Hot Springs	0.33
Mondorf	8.71
Pyrmont	7.05
Seltzer, at Saratoga Springs	4.97
Soden in the Taurus	3.42
Upper Blue Lick	8.37
Utah Hot Springs	17.05
Wiesbaden	6.82

Iodin and Bromin Waters.—These waters contain iodin and bromin in addition to sodium chlorid. The iodin occurs in the form of magnesium iodid, calcium iodid, and sodium iodid; the bromin, in the form of sodium and magnesium bromid. These waters increase the activity of the lymphatic vessels and hasten absorption; they are indicated in cases of scrofula, syphilis, and in diseases of the glands, as in goiter. The principal iodin waters are Heilbrunn, Kreuznach, Saratoga Kissingen and Congress.

The chemic composition of the important iodin and bromin waters is as follows;[1] 1 liter of water contains:

	Sodium chlorid. Grams.	Magnesium iodid. Grams.	Sodium iodid. Grams.	Sodium bromid. Grams.
Champion Spouting Spring	12.02	..	0.0039	0.0610
Excelsior Spring	6.34	..	0.0708	0.0610
Franklin Artesian Well	11.28	..	0.0040	0.0610
Hall	12.17	0.0420	0.0040	0.0610
Heilbrunn	4.98	0.0300	0.0040	0.0610
Ivonitch	8.37	0.0160	0.0040	0.0610
Krankenheil	0.29	0.0015	0.0040	0.0610
Kreuznach	10.52	0.0004	0.0040	0.0610
Lippik	0.61	0.0209	0.0040	0.0610
Lower Bowden (Lithia Spring)	2.13	0.0209	0.0120	0.0610
Red Spring (Tuscan Spring)	0.35	0.0209	0.0730 [2]	0.0610
Salzschlirf	10.24	0.0050	0.0730	0.0610
Salzbrun	1.90	0.0150	0.0730	0.0610
Saratoga (Kissingen Spring)	5.96	0.0150	0.0006	0.0308
Wildegg	10.02	0.0300	0.0006	0.0308
Woodhall Spa	19.50	0.0075 [3]	0.0006	0.0200 [4]
Zaizon	0.92	0.0010	0.0006	0.0200

Special importance has been attached to lithium, which is often present in sodium chlorid waters, and which is believed to have a special effect in dissolving uric acid. It is very doubtful if such an action occurs, yet these waters possess a markedly diuretic action. They are useful in the treatment of gout, and of renal and urinary concretions. Among the most important simple sodium chlorid waters

[1] Cohen's Physiologic Therapeutics, vol. ix., p. 432.
[2] Iodin.
[3] Potassium iodid.
[4] Potassium bromid.

may be mentioned those of Hamburg, Baden-Baden, Kissingen, Wiesbaden, Pyrmont, Byron Springs in California, Congress, Excelsior, Hathorn, High Rock, and Selzer at Saratoga. Among the lithia waters are Elizabethbrunnen at Homburg, Elster, Kissingen, Londonderry Lithia Springs, Geneva Lithia Springs, and Buffalo Lithia Springs.

III. **Bitter Waters.**—These waters are characterized by the large proportion of sodium sulphate and magnesium sulphate which they contain; they also contain varied proportions of magnesium chlorid, carbonate, and nitrate, calcium carbonate, and sodium chlorid. The magnesium sulphate acts as a purgative. These waters are indicated in small doses as stimulants to the intestinal peristalsis; they are useful in habitual constipation. The principal springs belonging to this class are the Apenta, Hunyadi János, Friedrichshall, Kissingen, Crab Orchard Springs, and Bedford Springs.

The following table [1] gives the chemic composition of the most important bitter waters; 1 liter of water contains:

	Sodium sulphate. *Grams.*	Magnesium sulphate. *Grams.*
Alap	19.14	2.90
Bedford Springs	..	0.55
Birmenstorf	7.00	2.20
Buda-Pest bitter waters:		
Apenta	15.40	24.40
Hunyadi János	22.56	22.35
Franz Josef	23.18	24.78
Victoria	33.50	24.19
Castalian Mineral Springs	11.14	
Crab Orchard Springs (Epsom or Foley's Springs)	1.01	35.51
Friedrichshall	6.05	5.15
Kissingen Bitterquelle	5.80	5.00
Le Roy Springs	2.00	5.43
Mergentheim	6.67	5.43
Pagosa Hot Springs	2.57	
Puellna	9.59	10.85
Saidschitz	6.09	10.96

IV. **Sulphurous Water.**—These waters contain hydrogen sulphid or some other sulphur compound, such as sodium, calcium, magnesium, or potassium sulphid. The sulphurous waters are obtained both hot and cold; they are especially useful in the treatment of syphilis and of chronic lead-poisoning, and in hemorrhoidal conditions and congestions of the liver. The principal sulphurous waters are the Anderson Sulphur Springs, California, French Lick Springs, Richfield Springs, and Cold Sulphur Springs.

V. **Iron Waters.**—These waters contain large proportions of iron; they are divided into the carbonated iron waters, sulphated iron waters, and iron and arsenic waters. The carbonated iron waters

[1] Cohen's Physiologic Therapeutics, vol. ix., p. 435.

contain large quantities of carbon dioxid; these waters increase the number of the red blood-cells and the amount of hemoglobin. They stimulate the appetite, but are apt to produce constipation. They are indicated in chlorosis and in anemia. Among the principal carbonated iron waters are those of Franzensbad, Pyrmont, Schwalbach, Richfield, Cresson (Pa.), and Rawley (Va.).

The chemic composition of carbonated iron water is as follows;[1] 1 liter of water contains:

	Iron bicarbonate. *Grams.*	Iron carbonate. *Grams.*	Free carbon dioxid. *C.c.*
Bartfeld	0.087	..	1683
Bochlet	0 087	..	1505
Cresson Springs	0.085	..	1505
Cudowa	0.063	..	1200
Elster	0.084	..	1266
Franzensbad	0.079	..	1528
Immau	0.052	..	987
Iron Ute Spring	0.052	0.057	987
Koenigswart	0.085	0.057	1163
Krynica	0.029	0.057	1513
Liebenstein	0.100	0.057	906
Marienbad	0.166	0.057	1173
Ojo Caliente	0.166	0.102	1173
Owosso Spring	0.273	0.102	1173
Pacific Congress Springs	0.239	0.102	1173
Pyrmont	0.077	0.102	1486
Richfield Iron Springs	0.085	0.102	1486
Rock Enon Springs	..	0.243[2]	1486
Schwalbach	0.080	0.243	1571
Spa	0.070	0.243	304
Sparta Artesian Well	0.010	0.243	304
Steben	0.060	0.243	1382
Szliacs	0.119	0.243	894
St. Moritz	0.035	0.243	1282
Vihnye	0.016	0.243	337

Sulphated Iron Waters.—These waters contain principally ferrous sulphate, in addition to sodium, magnesium, and calcium sulphate. Many of these waters also contain arsenic, alum, and sulphuric acid in small amounts. They are especially indicated in cases of chronic diarrhea, in anemic children, in chronic gastric catarrh, in ulcer of the stomach, and in chronic malarial cachexia. These waters should be given cautiously, as at times they produce indigestion and nausea. They are best taken in small individual doses. Among the principal sulphated iron waters are those of Sharon Chalybeate Spring, Bedford Alum Spring, Fauquier White Sulphur Springs, and Rockbridge Alum Springs.

The table[3] on the next page gives the chemic composition of the most important sulphated iron waters; 1 liter of water contains:

[1] Cohen's Physiologic Therapeutics, vol. ix., p. 444.
[2] Protoxid.
[3] Cohen's Physiologic Therapeutics, vol. ix., p. 445.

	Iron sulphate. Grams.
Alexisbad	0.046
Church Hill Alum Springs	2.718
Kittaning Mineral Spring	0.410
Mitterbad	0.290
Muskan	0.190
Oak Orchard Springs	0.565
Parad	1.100
Ratzes	0.300
Ronneby	2.490
Schuyler County Spring	1.197

Iron and Arsenic Waters.—These waters contain considerable quantities of arsenic in addition to the iron; they are indicated especially in chlorotic and anemic conditions, in chronic malaria, and in neuralgias. Among these waters may be mentioned Harbin Hot Sulphur Springs, Crockett Arsenic Lithia Springs, and Swineford Arsenic Lithia Spring.

The following table[1] gives the chemic composition of the most important iron and arsenic waters; 1 liter of water contains:

	Iron sulphate. Grams.	Arsenic acid. Grams.	Arsenous salts. Grams.
Crockett Arsenic Lithia Springs	0.0006	..	0.0003
Gueberquelle (Srebernik)	0.3700	0.0061	0.0003
Harbin Hot Sulphur Springs	0.0300	0.0061	0.0050
Lausigk	4.1800	0.0001	0.0050
Levico	2.5600	0.0086	0.0050
Recoaro	3.2000	0.0039	0.0050
Roncegno	3.0000	0.1500	0.0050

VI. **Earthy Mineral Waters.**—These waters are characterized by the presence of large amounts of calcium and magnesium salts. They diminish the production of acid in the stomach, and also the secretions from the respiratory, digestive, and urinary tracts. They are indicated especially in chronic catarrh of the urinary organs, in uric acid diathesis, gout, scrofula, and rachitis. In drinking these waters small quantities should be taken at first, and gradually increased until the flow of urine is markedly increased. Among these waters are those of Contrexeville, Marienbad, Wildungen, Manitou Springs, Mount Clemens Mineral Springs, Bedford Springs, Alleghany Springs, Capon Springs, and Greenbrier White Sulphur Springs.

The chemic composition of the most important earthy mineral waters is as follows;[2] 1 liter of water contains:

	Calcium sulphate. Grams.	Calcium bicarbonate. Grams.	Calcium carbonate. Grams.
Alleghany Springs	1.80	..	0.06
Allonez Mineral Springs	1.80	0.42	0.47[3]
Arkansas Hot Springs	1.80	0.42	0.12
Bath	1.50	0.42	0.12

[1] Cohen's Physiologic Therapeutics, vol. ix., p. 447.
[2] *Ibid.*, vol. ix., p. 451.
[3] Magnesium bicarbonate.

	Calcium sulphate. Grams.	Calcium bicarbonate. Grams.	Calcium carbonate. Grams.
Bedford Springs (Magnesia Springs)	1.84	0.42	0.12
Clifton Springs	1.18	0.42	0.16
Contrexeville	1.10	0.45	0.16
Driburg	1.04	1.44	0.16
Eaton Rapid Wells	0.77–0.94	1.44	0.34–0.78
Greenbrier White Sulphur Springs	1.33	1.44	0.12
Inselbad	..	0.30	0.12
Leukerbad	1.42	0.09	0.12
Lippspringe	0.82	0.41	0.12
Manitou Springs	0.82	0.41	0.40–1.11
Marienbad Rudolfsquelle	0.82	0.60	0.40–1.11
Old Sweet Springs	0.22	0.60	0.51
Szkleno	0.22	0.10	0.51
Warm Sulphur Springs	0.24	0.10	0.08
Weissenburg	0.24	1.27	0.08
Wildungen	2.00	1.27	0.08

VII. **Acratothermal Waters.**—These waters, also known as simple or "indifferent" waters, are characterized by the fact that they are obtained at a temperature of 85° F. or over. They do not, however, contain any active mineral ingredients. They are rarely used for drinking purposes, but are used mainly for thermal baths. (For a more complete description of mineral waters and their uses the reader is referred to the recent and most excellent volume on Balneology and Crunotherapy" by Kisch, Hinsdale, and Peale, in Cohen's System of Physiologic Therapeutics, vol. ix.)

Diet at Water Cures.—Water cures should always be carried out at the watering-places. Under exceptional circumstances a water cure may be ordered at the patient's home, but the results are never as satisfactory as when the patient has a change of air, of scene, plenty of out-door exercise, and freedom from care and worry. The methods and the diet vary greatly at different springs, and for the most part unnecessarily so. Many of the diets and methods are empiric and are not founded on any sound basis. Certain articles are forbidden at certain springs, often for most fanciful reasons. The routine and the diet of many springs is the same for all patients, quite regardless of the nature of the disease. An important factor in the failure of water cures is the abuse of water drinking. Patients with weak hearts, chronic nephritis, or dilated and atonic stomachs may easily take more water than can be disposed of, and positive injury may result.

As a rule, the water should be taken in the morning after rising, and from 200 to 800 c. cm. should be drunk slowly, preferably whilst the patient strolls about. One-half hour should invariably elapse before eating, and if large quantities of water are taken one hour should be the shortest interval between the water and food. Breakfast should be followed by walking or other out-door amusements and, if the patient is not obese and requires it, half an hour or an hour's

rest may be taken before and after the midday meal. In some cases water is taken between breakfast and the midday meal.

The afternoon should be spent out of doors if possible, and water may in some cases be taken in the afternoon, at least half an hour before afternoon tea or coffee. The evening meal should be light and taken not later than seven o'clock, and the patient should be in bed by nine o'clock. Care should be taken not to disturb too radically the habits of the old and infirm, as by so doing often more harm than good may result.

The diet ordered will, of course, depend upon the nature of the disease. In general, it may be stated that the diet should be that which the patient's condition calls for, and not the more or less arbitrary diet of the particular spring which the patient visits. Healthy individuals may take the strict cures if they so desire, and often find the change interesting and feel better for the mental effect so produced. In a general way the diet cures at watering-places forbid meats difficult of digestion, as fat or salt pork, smoked meats, fat sausage, pâté de foie gras, sardines, lobsters, eels, and the like, and certain vegetables are usually on the forbidden list, as cabbage, young potatoes, old peas, truffles, mushrooms, unripe and overripe or stale fruit, berries in some places, nuts as well as all very highly seasoned and complicated dishes, cheese, etc.

In general, all strong alcoholic beverages are forbidden, but, as a rule, light wine or beer is allowable in small quantities if the patient can be trusted not to take to much. Coffee and tea are usually allowed in moderate quantities, but chocolate or cocoa may be substituted in most instances when they are contraindicated, or some hot gruel or substitute for coffee may be taken. Smoking is usually forbidden, but this rule is very frequently broken. The advice of an enlightened physician at the cure is very valuable.

Besides water, there are a number of beverages that serve not only to meet the physical needs of the body, but are also taken to produce a stimulant effect. They also serve the purpose of a stimulant where such is necessary from time to time, as in the case of disease. The habit of using beverages, either for the purpose of relieving fatigue or for conviviality, is most pernicious, as it is apt to induce a habit for taking such drinks, which in time leads to excesses. We shall now take up in order the other beverages—tea, coffee, cocoa, and the various alcoholic stimulants.

TEA

Tea is a preparation made from the leaves of an evergreen plant known as *Thea*. It is grown in China, Japan, India, Ceylon, and in North Carolina. There are many varieties of the plant, and the flavor of tea varies with its source and the variety of the plant. There are two great classes of teas, the green and the black, the

distinction between the two being due to the method of preparation. Several times during the year the plant sends out young shoots, which are picked as often as they appear. Black tea is prepared by exposing the fresh leaves to the rays of the sun; after they have become withered the constituents are liberated by rolling and breaking up the fibers and cells of the leaf. The broken-up leaves are then collected and allowed to ferment while still moist; during this process the tannic acid is rendered less soluble while the essential oils are increased. After again exposing them to the sun the leaves are dried in an oven. In the process of preparing green tea the Chinese "wither" the leaves in pans at a temperature of 160° F.; the Japanese steam them. The fluid principles are then liberated by breaking up the leaves; finally they are again withered, sweated in bags, and slowly roasted. The chief difference between black and green tea lies in the fact that black tea is fermented while green is not. As in the process of fermentation the tannic acid becomes less soluble, black tea contains much less tannic acid than green tea. The following table, from Bannister,[1] gives the composition of black and of green tea:

	Black tea.	Green tea.
Water	8.20	5.96
Caffein	3.24	2.33
Albumin (insoluble)	17.20	16.83
Albumin (soluble)	0.70	0.80
Alcoholic extract	6.79	7.05
Dextrin	..	0.50
Pectin and pectic acid	2.60	3.22
Tannic acid	16.40	27.14
Chlorophyll and resin	4.60	4.20
Cellulose	34.00	25.90
Ash	6.27	6.07

Tea has practically no nutrient-ingredients. Its principal constituents are caffein and tannic acid, and its special aroma is due to a volatile oil. It owes its stimulating effect to the presence of caffein. As the action of tannic acid is detrimental to the process of digestion, tea should be so prepared as to contain as large a proportion of caffein as possible and the smallest possible amount of tannic acid.

When the leaves are placed in boiling water, caffein is extracted very rapidly. Tannic acid, however, is much less soluble; it follows, therefore, that in order to have as little tannic acid in the tea as possible, the leaves should be boiled in water for as short a time as practicable. To prepare the infusion pour boiling water on the tea-leaves and allow the mixture to stand where it will keep hot, though not boil, for from three to five minutes. Water used in preparing tea should not be hard or stale.

When the tannic acid which tea contains occurs in large quantities, the pepsin of the gastric juice is precipitated; in weaker solutions tea

[1] Cantor Lectures, 1890.

retards digestion. For these reasons tea is not a suitable beverage for persons suffering from gastric disturbances. Among the more prominent symptoms of excessive tea-drinking are gastric disorders, cardiac distress, and a variety of nervous symptoms, such as excitability, sleeplessness, and muscular incoördination.

COFFEE

Coffee was introduced into Europe in the same century as tea, and only a few years later. It is prepared from the seeds of *Coffea arabica,* which was originally grown in Arabia, but has since been cultivated in Java, Ceylon, Costa Rica, and Brazil. The fruit of the plant, which has the appearance of a cherry, when opened discloses the coffee-bean. In order to prepare the beans for use they are dried at a high temperature and then roasted and ground. In roasting, one-fifth of the caffein and one-tenth of the fat present are lost. The aroma of coffee is due to the presence of caffeol, an oil liberated in roasting. According to Hutchison (p. 310), a cup of black coffee contains about as large a quantity of tannic acid and caffein as a cup of tea. Coffee is often adulterated, chicory, acorns, and other substances being added for this purpose. The adulteration may not be injurious in its effect, but alters, sometimes even agreeably, the flavor of the coffee.

In gouty, nephritic and arterio-sclerotic patients it may be desirable to omit coffee from the dietary on account of the large quantities of caffein bodies which this beverage contains. There are two preparations however from which a large portion of the caffein has been extracted, i e., Dekofa and Kaffee-Hag, to which this objection does not hold, if taken in moderation. Dekofa contains about 0.13 caffein and Kaffee-Hag only 0.03 per cent.

Preparation of Coffee.—In order to obtain coffee of the finest flavor, the beans should be roasted and ground shortly before they are to be used, as the flavor is impaired by exposure to the air after grinding. The water should have reached the boiling-point before it is poured over the coffee. The pot should then be placed for a few moments in a hot place, but boiling must not be allowed to continue, or the aroma will be lost and the coffee contain too large a percentage of tannic acid.

The effect of coffee on the system is that of a stimulant, due to the caffein present; it acts directly on the cerebral centers, stimulates the heart, and deepens the respirations. It is an excitant of the nervous system, and in some persons produces nervousness, excitability, and insomnia; in others it acts as an agreeable stimulant. In persons suffering from dyspepsia it has a tendency to disturb digestion. It lessens the strain of fatigue, and soldiers frequently depend upon its stimulating effect during long marches.

The following table, taken from Bannister's Cantor Lectures, gives the composition of raw and of roasted coffee:

	Mocha.		East Indian.	
	Raw.	Roasted.	Raw.	Roasted.
Caffein	1.08	0.82	1.11	1.05
Saccharine matter	9.55	0.43	8.90	0.41
Caffeic acids	8.46	4.74	9.58	4.52
Alcoholic extract (nitrogenous and coloring-matter)	6.90	14.14	4.31	12.67
Fat and oil	12.60	13.59	11.81	13.41
Legumin	9.87	11.23	11.23	13.13
Dextrin	0.87	1.24	0.84	1.38
Cellulose and insoluble coloring-matter	37.95	38.62	38.60	47.42
Ash	3.74	4.56	3.98	4.88
Moisture	8.98	0.63	9.64	1.13

COCOA

Cocoa was introduced into Europe long before either coffee or tea. It is prepared from the seeds of the cacao tree, *Theobroma cacao.* The seeds are contained in a pulpy fruit, somewhat resembling a cucumber, from which they are extracted. The fruit is gathered into heaps and allowed to ferment, when the pulp becomes loosened. During this process the seeds become dark and lose some of their bitterness. They are then roasted, by which process they are broken into bits, constituting the so-called ''cocoa nibs.'' A decoction of cocoa nibs is made by boiling the seeds in water for several hours and removing the residue by straining. Cocoa, as ordinarily prepared, is made by grinding the seeds into a paste, to which sugar or starch is added; if starch is used, the cocoa is boiled for a few minutes, but if sugar is added, the cocoa only requires the addition of boiling water or milk.

Theobromin, the chief alkaloid present in cocoa, occurs in amounts of from 1 to 2 per cent. Cocoa also contains nitrogenous substances, 15 per cent.; tannic acid, 5 per cent.; starch, 5 to 15 per cent.; fat, known as cocoa-butter, 45 to 50 per cent.; mineral constituents, 2 to 3 per cent.

Theobromin, while a stimulant, is less apt to induce nervous symptoms, such as sleeplessness and palpitation, than either tea or coffee. By reason of the large proportion of sugar and fat contained in it, however, when used in excess, cocoa is likely to produce indigestion. When not too rich, it forms a nutritious drink especially useful for children and for convalescents.

The table on the next page, taken from Ewell,[1] gives the chemic analysis of various cocoa preparations.

Chocolate is prepared by adding starch, sugar, and such flavoring

[1] Allen's Commercial Organic Analysis, vol. iii, p. 2.

	Fat.	Fiber.	Cane-sugar.	Ash.	Added starch.
Fry's cocoa extract . . .	30.95	3.89	. .	4.24	None.
Schmitzer's cocoatuia . .	31.13	3.70	. .	6.33	"
Van Houten's cocoa . .	29.81	4.38	. .	8.64	"
Blooker's Dutch cocoa .	31.48	3.76	. .	6.06	"
Rountree's cocoa extract	27.56	4.42	. .	8.48	"
Rountree's powdered chocolate	25.84	1.30	51	1.66	Very little arrow root.
Epp's prepared cocoa . .	25.94	1.51	26	3.15	Much arrow-root.
Fry's diamond sweet chocolate	18.60	0.81	55	1.16	Much wheat-starch and some arrow-root.
London cocoa (unknown maker)	11.13	2.13	32	2.82	Much arrow-root.
Chocolat-Ménier	21.13	1.10	58	1.40	None.

substances as vanilla to cocoa. It contains 1.5 per cent. of theobromin, 15 per cent. of fat, 5 per cent. of nitrogenous substances, and about 60 per cent. of sugar.

In addition to their stimulating effect, cocoa and chocolate possess a marked nutrient value not possessed by either tea or coffee.

The **kola nut** possesses properties similar to those of cocoa. It contains an alkaloid, caffein, thein, or theobromin.

ALCOHOL

Alcohol is produced by the fermentation of sugars with yeast, and the principal constituent in all alcoholic beverages is ethyl alcohol, although other constituents may modify the action of various beverages so that the effect produced is not always exactly the same. The glucose contained in fruits is fermented directly into alcohol, whereas the starches, in such substances as potatoes, grains, etc., are converted into dextrin and maltose, and then by the aid of diastatic ferments, before the alcoholic fermentation can take place, they are converted into glucose.

Alcohol has a food value of 7 calories per gram, and the law of the conservation of energy obtains with the alcohol diet just as with the ordinary diet, and the energy of the alcohol oxidized in the body is transformed completely into kinetic energy and appears either as heat, or as muscular work, or both. To this extent, at any rate, it is used like the energy of protein, fats, and carbohydrates. The fat protection following the use of alcohol is very slightly different from that of ordinary food, and it apparently protects the body fat quite as effectively as do the fats and carbohydrates for which it is substituted. The power of alcohol to protect the protein of food or body tissue, or both, from consumption has been clearly demonstrated by Atwater. Its action in this respect appears to be similar to that of the carbohydrates and fats, and in this way alcohol serves the body as food. In some cases it is apparently equal, and in others inferior, to fat and carbohydrate, but it is by no means certain that these latter are always equal to each other in this power. At times it

seems to exert a special action, and in large quantities is positively toxic and may retard, or even prevent, metabolism in general, and protein metabolism in particular. On the other hand, in small doses it seems, at times, to have an opposite influence, tending to increase disintegration of protein. This action, though not conclusively demonstrated, is very probable, and thus affords a satisfactory explanation for the occasional failure of alcohol to protect protein. Atwater states that the only justification for calling alcohol a protein poison is found in this disintegrating tendency. This action appears to be temporary and most liable to occur in people little accustomed to its use, and the circumstances under which it occurs cannot be fully defined. In moderate quantities alcohol produces no considerable increase in the amount of heat radiated from the body, but in large quantities it causes a dilatation of the vessels of the skin, increases the circulation through the vessels near the surface, and thus increases heat radiation.

The question of alcohol as a source of muscular energy is one of considerable interest. It would seem, from Atwater's experiments, that it contributes its share for muscular work, but its desirability as a part of the diet for muscular work must be decided not on this fact alone, but on the effect of the alcohol on the character of work. Alcohol has a favorable action on the performance of muscular work both when the muscles are vigorous and when they are exhausted, and this effect is seen almost immediately after the administration, but lasts for a very short time and is succeeded by a paralyzing action. This later paralyzing action overbalances the primary stimulating effect, so that the sum total of the amount of work done with alcohol is less than that done without it. Similar depressing effects are not seen to follow the use of tea, coffee, or kola. In practical tests with the use of alcohol in the diet of people engaged in muscular labor it seemed to prove that the subjects work to a slightly better advantage with ordinary rations than with those containing alcohol.

Atwater found that the effect of alcohol in small quantities is slightly to increase the digestibility of proteins, but not to alter the digestibility of other nutrients, that is, carbohydrates and fats. At least 98 per cent. of alcohol ingested is oxidized in the body, whereas ordinarily 98 per cent. of carbohydrates, 95 per cent. of fats, and 93 per cent. of proteins are oxidized. The rapidity with which alcohol is absorbed, and the ease with which it is oxidized, make it a valuable adjunct in feeding individuals in extreme wasted conditions, as in prolonged fevers.

Quite as important as Atwater's experiments on the nutritive value of alcohol is the valuable review of Abel on the Pharmacologic and Physiologic Action of Alcohol, published in Physiologic Aspects of the Liquor Problem.

As far as experimental evidence goes, if alcohol is introduced into

the body without local irritation, it is, strictly speaking, not a circulatory stimulant. In moderate quantities it has no effect on the heart itself, and neither stimulates nor depresses it, but this statement is based on laboratory experiments covering only a short period of time and may not hold good for the effect in the prolonged daily use. Large quantities of alcohol weaken the heart. It has no action either on the peripheral or central ends of the nerves which control the rate and force of the heart, except under unusual circumstances, as in prolonged or severe intoxication. In moderate quantities it has no effect on the arterial blood-pressure, but when sufficient has been given to induce a change it is a fall and not a rise, except under certain circumstances, where the circulatory apparatus is in an abnormal condition. In the early stages of its action it causes some flushing of the skin and brain, and later, when very large quantities have been taken, dilatation of the abdominal vessels occurs. The fall of blood-pressure due to very large quantities is a toxic phenomenon, and is due to the depressant action of the alcohol on the nervous centers which control the calibers of the arteries and also in part to the weakened heart. When alcohol is introduced into the circulation it acts as a narcotic, but owing to its local effect on the mucous membranes, and through its cerebral action on the various parts of the circulatory system, a train of phenomena may be produced which justify, to a certain degree, the term "circulatory stimulant." Most common of these is the slowing or quickening of the pulse-rate, as frequently observed in medical practice.

On the respiration alcohol acts as a respiratory stimulant of moderate power for human beings. During a period of an hour or more after its administration it causes an increase in the volume of air passing through the lungs and in the absorption of oxygen (3.5 per cent.).

Highly flavored wines, brandy and other alcoholic beverages which contain larger amounts of stimulating esters, have a more pronounced action than ethyl alcohol, and the stimulating action of alcoholic beverages is greater in the case of fatigued persons than in those in nowise exhausted. Increased heat dissipation always accompanies the above-named effects. The compensatory increase in heat production requires an increase in the oxidative processes in the tissues, and the increased demands for oxygen is the direct cause of the increased activity of the respiratory center. Small doses of alcohol have also the effect of increasing the movements of the digestive tract and of causing a state of unrest or tension in the skeletal muscles, and thus further adding to the demand for oxygen.

How far the action of alcohol on the central nervous system, and how far its influence as a protoplasmic poison may modify its operation as an antipyretic; how far variations in the external temperature, in the humidity of the air, and in the temperature of the body itself

influence its action, must all receive further study. In a word, the detailed chemic and physiologic studies similar to those that have been made on other antipyretics are demanded. Such studies will probably tend to harmonize the conflicting views at present entertained in regard to the use of alcohol in fever, and explain the more deleterious effects of alcohol in polar and tropical, as compared with temperate regions.

The effect of alcohol on the digestion and secretion is to increase the flow of saliva from the stimulating effect of the alcoholic beverage in the mouth. This acceleration of secretion is, however, of brief duration. Not only is the volume of saliva increased, but also the organic and inorganic constituents. This effect is in no sense peculiar to alcohol, but is common to many so-called stimulants. Upon the gastric secretion alcohol and alcoholic liquids have a marked effect, increasing both the quantity of gastric juice, the amount of acid, and the total solids, and this action is exerted not only by the presence of alcoholic beverages in the stomach, but also indirectly through the influence of alcohol absorbed from the intestine. This increase in the flow of gastric juice may counterbalance the greater or lesser retardation of the digestive changes caused by alcoholic beverages. This retardation may not be great in some instances, owing to the rapid disappearance of the alcohol from the alimentary canal.

The effect of alcohol on the nervous system varies greatly in different races, in different individuals, and under different circumstances, and there are also variations in its action according to the choice of beverage, though this is by no means constant. The environment is another factor, and gay companions, bright light, and music increase the exhilarating effects. In small quantities it produces, in most individuals, a feeling of well-being and good fellowship, and, in larger quantities, it causes a tendency to loquacity, gesticulation, and a feeling of self-confidence. The face is usually flushed, the eyes brighter, and the self-control lessened. In still larger quantities, the individual becomes boisterous, may wish to sing, shout, fight, and in other ways disregard the ordinary conventions of life. Larger quantities are liable to be followed by muscular incoördination, shown in the uncertain movements, staggering gait, and stammering speech. Sooner or later sleep follows, from which the individual awakes with various unpleasant symptoms, chief of which are thirst, nausea, vomiting, headache, and neuralgia, and sometimes acute or subacute gastritis. After very large quantities a condition resembling chloroform anesthesia supervenes.

There are two opinions concerning the action of alcohol on the nervous system, that of Binz and others, who believe that it first stimulates and then depresses, and that of Schmiedeburg, Bunge, and others, who think that it depresses from the start, and explain the apparent stimulation by a depression of the inhibitory centers.

On the intellectual faculties the receptive powers are lessened even by small quantities, but small quantities lessen the time required for simple association processes, such as rhyming, while larger quantities depress all the intellectual faculties. The individual often believes he is doing better work and more quickly, when, in reality, the work is not as good, and takes a longer time than without the alcohol. Experiments with typesetters and others show that alcohol causes the worker to make a greater number of errors than he would without it.

The deleterious effects of larger quantities of alcohol than the individual can metabolize, continued over long periods of time, are too familiar to need description. While it is true that many individuals take considerable alcohol daily over long periods of time without causing any pathologic changes, we have demonstrated on animals and it is frequently seen in man that cirrhosis of the liver, kidney, and other organs may be caused by alcohol, although fatty degeneration of the liver, kidneys, heart, and vessels is rather the more common change. The more concentrated the alcohol and the larger the quantity taken in a single dose, the more liable is alcohol to cause tissue changes. There is considerable reason to believe that alcohol is not as great a factor in causing arteriosclerosis as was formerly believed.

The Use of Alcohol as a Food and in Medicine.—The use of alcohol is of undoubted value in medicine, and the sweeping condemnation that it has received from many quarters in recent years is not merited. The use and abuse have been confused.

As a food it can be utilized only within certain limits, as only what would represent 2 ounces of alcohol can be metabolized by the average individual within twenty-four hours. For some this is too low an estimate, and for others even this amount could not be utilized without the production of symptoms or unpleasant after-effects. In fevers and other conditions, where sufficient food cannot be administered, alcohol may be added to the diet with good effect, and in toxic conditions, such as are often seen in typhoid, it is of incalculable value. It is readily absorbed, easily assimilated, and seems in these toxic cases to aid in combating the toxemia.

It is frequently used as a stomachic, to produce an appetite and to stimulate the secretion of gastric juice. It acts also as a respiratory stimulant, and may be used in conditions of heart weakness and disturbances of the circulation, as through its cerebral and local action it may influence the circulation favorably, causing, as it were, the re-establishment of more or less normal conditions by dilating superficial vessels, and by slowing or accelerating the pulse-rate, and by its numerous indirect influences causing a different balance in the parts and functions of the vasculatory apparatus.

It is contraindicated in individuals who have previously been victims of the alcohol habit and are liable to acquire it again, and in individuals who come from families that are prone to form drug

habits. It should not be used where it causes unpleasant symptoms or excitement, although these may be due to too large doses. If the odor is apparent on the breath some time after the administration, it is very probable that the quantity administered has been too great. Small, repeated doses, well diluted with water, give better results than larger or more concentrated doses. The best indications that the alcohol is well borne is a change for the better in the general appearance and condition, with improved circulation as evidenced in the appearance, pulse-rate, arterial tension, and the quality of the heart sounds. In severe toxic conditions, from ½ to 1 ounce of whisky and, in some instances, more may be given every one, two, or three hours, according to the effect produced.

Consumption of Alcohol.—According to Thompson, the total consumption of alcoholic beverages a year in America is more than 1,000,000,000 gallons. The following table, taken from Thompson's Dietetics, p. 239, gives the annual per capita consumption of alcoholic beverages in 1890:

	Beer.	Wine.	Spirits.
England	30.31	0.39	1.02
France	5.10	21.80	1.84
Germany	25.50	1.34	1.84
United States	12.30	0.44	0.84

The previous editions of this work contain numerous tables of analyses of various alcoholic drinks.

Alcoholic beverages are divided into several classes, *e. g.*, spirits, liqueurs and bitters, malt liquors, wines etc.

SPIRITS

Spirits are produced by fermenting saccharine substances and obtaining the alcohol by distillation. Of these substances, corn, rice, barley, molasses, and potatoes are those most commonly utilized for this purpose. In addition to the alcohol, by-products are formed, and it is to these that spirits owe their characteristic flavor and odor. The by-products contain the higher alcohols, such as propyl, butyl, and amyl alcohol, this mixture forming what is known as fusel oil.

Whisky.—The United States Pharmacopeia formerly defined whisky as "an alcoholic liquid obtained by distillation of the mash of fermented grain (usually of mixtures of corn, wheat, and rye) and at least four years old." Whisky possesses an alcoholic strength of from 50 to 58 per cent. by volume. It should be free from disagreeable odor. The ether and aldehyds contained in whisky become altered in character as it ages, and the flavor is thus rendered more agreeable.

Brandy.—In the United States Pharmacopeia brandy was defined as an "alcoholic liquid obtained by the distillation of the fermented unmodified juice of fresh grapes, and at least four years old." Brandy contains from 46 to 55 per cent. by volume of alcohol. The quality of brandy depends upon the variety of grapes used and upon

the length of time the brandy is allowed to stand: The older the brandy, the better the quality. With brandy, just as with whisky, on standing ethers and aldehyds are produced to which the special flavor of the brandy is due.

The color of brandy is due to the tannic acid extracted from the oak casks in which the brandy is contained. There are many inferior grades of brandy on the market, some being merely alcohol colored and flavored with various essences.

Rum.—Rum is the product of the distillation of fermented molasses, its flavor being due to certain by-products. Some of the so-called ''rum'' of the market is made by adding various essences to alcohol. On standing, by the development of special aldehyds and ethers, rum improves in quality. It contains about the same percentage of alcohol as do brandy and whisky.

Gin.—Gin is produced by the distillation of rye and malt mash, its flavor being due to juniper berries which are added during fermentation. Inferior grades of gin are manufactured by adding juniper berries, turpentine, etc., to alcohol. Gin contains from 15 to 20 per cent. of alcohol; but the strength is sometimes increased by the addition of alcohol, so that it may contain as much as 35 per cent. of alcohol.

LIQUEURS AND BITTERS

Liqueurs or cordials and bitters contain a large proportion of alcohol, and a high percentage of sugar and essential oils.

MALT LIQUORS

Under the heading of malt liquors are included beer or ale and stout or porter. These beverages are made by fermenting malt and hops. Malt is produced by allowing moistened barley to germinate at a moderate temperature; in this process the diastatic ferment acts upon the starch, converting it into sugar and dextrin. After drying and grinding, the malt is mixed with water and thus made into a mash, which is again heated, thus more completely changing the starches into sugar.

Beer.—The quality of the beer depends largely upon the temperature at which the process of manufacture is carried on. Pale beer is produced by drying the mash at low temperature, whereas the darker beers are the result of drying the malt at a higher temperature. The infusion of malt is termed ''mash.'' The diastatic action of malt is inhibited by boiling the ''mash'' with hops; in this way tannic acid and extractives are withdrawn. The mash is now cooled and fermented with yeast. In order to secure a pure beer, great caution must be exercised to procure pure yeast. The yeast that rises to the surface after fermentation is skimmed off, the remainder

settling at the bottom. Beer is now placed in casks, the yeast which was allowed to remain continuing to produce fermentation. The longer this process is allowed to continue, the stronger is the percentage of alcohol in beer. The mild or bitter beers are distinguished by the relative proportion of hops contained in them; the milder forms contain considerable quantities of hops, whereas the bitter ones contain but small amounts.

Volatile bodies are also produced which, in addition to the carbonic acid gas formed, add to the pleasant flavor of the beer. In order to add to the keeping qualities of beer various preservatives are added, such as calcium sulphate, salicylic acid, etc. These substances not only affect the flavor of the beer, but when taken in large quantities have a deleterious effect on the system.

Porter and Stout.—Porter and stout are made by fermenting malt, the latter, however, being roasted, during which process a certain amount of caramel is produced. It is to this substance that the dark color is due. Beer as well as stout contains from 3 to 8 per cent. of alcohol, from 2 to 5 per cent. of dextrin, and from 0.5 to 1 per cent. of sugar.

The following table[1] gives the composition of some malt liquors:

	Water.	Alcohol per cent. by volume.	Total extract.	Proteid.	Sugar.	Dextrins.	Acidity as lactic acid.	Ash.
Bavarian winter beer	91.81	3.21	4.99	0.81	0.44	2.92	0.116	0.20
Bavarian summer beer	90.71	3.68	5.61	0.49	0.87	4.39	0.128	0.22
Munich Hofbrau . .	. .	3.70	5.87					
Munich Spatenbrau .	. .	3.23	6.61					
Pilsener	91.15	3.46	4.97	0.37	. .	. .	0.160	0.20
Munich Bock-beer .	88.72	4.07	7.23	0.71	0.90	. .	0.170	0.27
English ale and porter	89.10	4.89	6.03	0.53	0.84	. .	0.310	0.31
Berlin white beer . .	. .	3.91	4.85					

WINE

Wine is produced by the fermentation of grape-juice, the juice being first pressed from the grape by crushing. There are a number of factors, such as the character of the grape utilized, its cultivation, and the method of manufacturing, that enter into the production of a good wine.

The following table, taken from Dupré,[2] gives the main constituents of grape-juice and the wine that is manufactured therefrom. Grape-juice or must contains—

[1] Leyden's Handbuch der Ernährungs-Therapie, p. 105.
[2] "What is Wine?" Popular Science Review, vol. vii.

Water
Grape-sugar
Fruit-sugar } 10 to 30 per cent.
Malic acid.
Tartaric acid.
Racemic acid.
Albuminous substances.
Vegetable mucus.
Essential oils.
Extractives.
Mineral substances.
Tannic acid.
Coloring-matters
Fatty substances } From the skins and kernels.

Wine contains—

Water
Grape-sugar
Fruit-sugar } 0 to 6 per cent.
Ethylic alcohol
Propylic alcohol
Butylic alcohol
Amylic alcohol } 5 to 22 per cent.
Other higher alcohols.
Malic acid
Tartaric acid
Racemic acid
Succinic acid
Acetic acid
Formic acid
Propionic acid
Butyric acid } 0.3 to 0.8 per cent.
Ethers of foregoing alcohols and acids.
Glycerin.
Aldehyd.
Carbonic acid and ammonia.
Trimethylamin.
Oils produced by fermentation.
Albuminous matter.
Vegetable mucus.
Coloring-matter.
Tannic acid.
Extractives.
Mineral matters, 0.15 to 0.6 per cent.

Among the constituents of the juice of the grape are albuminous substances, grape- and fruit-sugar, and tartaric and tannic acids. The yeast that grows upon the albumins ferments the sugar, with the production of alcohol. The character of the wine depends upon the quantity of albuminous material present: if there is little albumin, the yeast soon ceases in its work of converting sugar into alcohol, in consequence of which the wine produced is sweet; on the other hand, if there is much albuminous material present, the yeast continues to grow until all the sugar is converted into alcohol.

Ordinarily, wine does not contain more than 16 per cent. of alcohol, inasmuch as the action of the yeast is inhibited by this percentage of alcohol. Frequently, however, wine is "fortified" by the addition of alcohol; this is true of port, which is always "fortified."

The yeast used in the fermentation of grape-juice is obtained in pure cultures and added to the juice to produce the required flavor.

The methods of wine-production vary greatly, and require no description here. Suffice it to say that the fermentation at first lasts from three to six weeks; the albuminous material is removed a number of times, and the wine is then placed in casks; here the percentage of alcohol increases, and the color of the wine becomes fixed. Fermentation still goes on, however, and may continue for many years, thus increasing the percentage of alcohol.

Ethers are also produced, which continue to be formed even after the wine has been placed in bottles. The color of red wine is due to a coloring-matter contained in the skin of the grapes.

Acids.—The most important acids contained in wine are tartaric, malic, and tannic; others of less importance are acetic and succinic. Tartaric acid occurs in combination with potassium as potassium

bitartrate. The total amount of acids in wine varies, but rarely exceeds 0.5 per cent.

Alcohol.—There are several alcohols present in wine; ethyl alcohol occurs in largest quantity; amyl, propyl, and butyl alcohol are also present in varying amounts. As has been stated, natural wine never contains more than 16 per cent. of alcohol; if it contains more than this amount, it has been "fortified." This is often done, especially when the wine is to be shipped from warm countries to foreign districts, to prevent it souring.

Sugar.—Sour wines contain about 1 per cent., and sweet wines about 4 per cent., of sugar; it is evident, therefore, that sugar is present in too small a quantity to be of any food-value.

Ethers.—Many varieties of ethers are present in wine; they are produced by the action of the alcohols and acids upon each other. It is to the character and quantity of the ethers contained in them that the flavor of various kinds of wines is largely due.

Glycerin.—Glycerin is present in wine in about one-fourteenth of the volume of the alcohol.

Extractives.—A large part of the solid material of the wine is made up of extractives, mainly the carbohydrates, as pectins and gums.

Varieties of Wines.—From a dietetic standpoint the classification of Chambers is probably the most practical; according to this author, wines are divided into seven classes:

1. Strong dry wines.
2. Strong sweet wines.
3. Aromatic wines.
4. Acid wines.
5. Sparkling wines.
6. Perfect wines.
7. Rough or astringent wines.

1. **Strong Dry Wines.**—These are wines that contain a large percentage of alcohol, to which, as a rule, additional alcohol has been added in their production; in other words, they are "fortified." Examples of this class of wines are port, sherry, and Madeira. In cases of fever these wines are utilized in place of whisky. Port contains from 15 to 20 per cent. of alcohol and considerable tannic acid. Sherry is a fortified wine; it contains from 15 to 22 per cent. of alcohol.

2. **Strong Sweet Wines.**—These wines contain fruit-sugar in quantities sufficient to act as a preservative and prevent further fermentation. Under this head may be mentioned Tokay, Malaga, and sweet champagne. They contain from 18 to 22 per cent. of alcohol and from 3 to 5 per cent. of sugar.

3. **Aromatic Wines.**—Aromatic wines possess a superior flavor and contain essential oils and considerable alcohol; examples of this class of wines are Moselle, Capri, and some of the Rhine wines.

4. **Acid Wines.**—The distinguishing feature of this class of wines is the large quantity of acid they contain.

5. **Sparkling Wines.**—Sparkling wines contain considerable quanti-

ties of carbonic acid gas, to which their exhilarating effect is due. The chief variety of this class of wines is champagne. The dryness or sweetness of champagne depends upon the proportion of cane-sugar and cognac added during the process of manufacture. In the manufacture of dry champagne 8 per cent. of sugar is added, while the sweet brands contain as much as 16 per cent. Since dry champagne does not contain large quantities of sugar, and since the larger part of the sugar it originally contained has disappeared during fermentation, it is considered less likely to produce flatulence, and is therefore preferred by invalids. Dry champagne is a pure wine containing from 9 to 12 per cent. of alcohol and from 1 to 4 per cent. of sugar.

6. **Perfect Wines.**—Perfect wines are defined by Chambers as those containing alcohol, water, sugar, ethereal flavors, fruity extractives, and acids. Under this head come Burgundy and Bordeaux. Burgundy contains a rather large percentage of alcohol and extractive matter; it is, therefore, said to have considerable "body." Good Bordeaux wines are thoroughly fermented, and, together with the Burgundies, contain very little sugar; they are, therefore, well borne by invalids, and are especially useful as tonics during convalescence from protracted illnesses.

Rough Wines.—Rough wines contain considerable quantities of tannic acid, to which they owe their astringent effect. They contain little alcohol, and are of slight value for medicinal purposes.

Dupré gives the following table:

Wine.	Grams absolute alcohol.	Free fixed acid.	Free volatile acid.	Total acid.	Sugar.	Dry residue.	Ash.	Total alcohol in ethers.
Hock (three samples	9.73	0.399	0.088	0.506	0.062	1.920	0.17	0.042
Claret (three samples)	9.68	0.390	0.167	0.599	0.243	2.124	0.21	0.038
Hungarian wine (three samples)	10.16	0.454	0.192	0.694	0.077	1.906	0.18	0.046
Greek wine (three samples)	12.35	0.342	0.215	0.611	0.225	2.507	0.30	0.048
Sherry (three samples)	17.80	0.286	0.161	0.487	3.015	5.060	0.50	0.061
Madeira (two samples)	17.82	0.373	0.247	0.680	1.850	4.440	0.37	0.096
Port (three samples)	18.11	0.309	0.090	0.434	2.540	5.340	0.23	0.053
Marsala	16.80	0.206	0.120	0.361	3.500	5.360	0.26	0.049

ACTION AND THERAPEUTIC USE OF MALT LIQUORS AND WINES

Malt liquors, when taken in moderate quantities, seem to aid digestion, increase the appetite, and stimulate gastric secretion. Occasionally, especially in those who lead a sedentary life, they give rise to indigestion and gastric acidity. On account of the large quantities of carbohydrates they contain they have considerable food-value. The use of malt liquors is contraindicated especially in such conditions as gout, obesity, diabetes, and diseases of the urinary tract.

Wines appear to exert a depressing effect on the gastric secretion. Taken in moderate quantities, however, by increasing the appetite

and the motor function of the stomach, this depressing effect is not only overcome, but the digestion is also greatly improved.

Anstie[1] gives the following conclusions as to the use of wine in health:

"Wines for daily use by healthy adults should not on the average contain more than 10 per cent. absolute alcohol (by weight); 8 or 9 per cent. is better.

"If wine be used as the daily drink, it is best, as far as may be, to use only one kind at a time and no other form of alcoholic liquor.

"Sound natural wines are to be obtained at the best economic advantage from the Bordeaux district; the red wines are to be preferred. Rhine wines (white) are equally excellent, but more expensive.

"Hungarian wines are also in many instances excellent, but they are unequal in quality, owing to defects of manufacture.

"Greek wines labor under the same defects.

"The fortified wines, as a class, develop no proper vinous qualities till they have been for some years in bottle. Sherry, however, is greatly superior to the other wines of this class in the rapidity with which it develops the volatile ethers.

"Fortified wines in small quantities, especially sherry, for the reason just named, are the appropriate stimuli of certain kinds of infantile and youthful debility, and of the enfeebled nervous system of old persons.

"Half a bottle of a natural wine a day for a sedentary and a bottle a day for a vigorous and actively employed adult affords a reasonable and prudent allowance of alcohol, and this quantity of wine, either alone or with water, will be enough to satisfy the needs of moderate persons for a beverage at luncheon and dinner, the only two meals at which alcohol should, as a rule, be taken."

CIDER

Cider is a beverage prepared from the fermented juice of ripe apples. The amount of alcohol contained in this beverage varies between 3 and 8 per cent. by volume. It also contains malic acid, salts, sugar, albuminoids, and extractives. Cider is a diuretic drink and acts as a laxative. On exposure it undergoes an acetic acid fermentation, whereby it is rendered unfit for drinking purposes.

[1] On the Uses of Wine in Health and Disease, 1877, p. 39.

VARIOUS FACTORS IN RELATION TO DIET

CONCENTRATION OF FOOD

Concentrated foods are those from which the larger portion of the water present has been abstracted, and thus the weight and the bulk of the food diminished. There are many patented concentrated foods on the market. They find their chief use in the treatment of patients who take too little of the usual forms of food to maintain strength, and, second, in cases where it is important that a large quantity of nourishment be taken.

Food can be concentrated to various degrees. Desiccated meat is the most concentrated form of protein; sugar, the most concentrated form of carbohydrate; and olive oil, the most concentrated form of fat.

1. **Concentrated Proteins.**—These foods are prepared from milk, meat, eggs, and vegetables. *Meat* is concentrated by drying, and in this form it is generally indigestible; which can, however, be overcome by predigestion or powdering; in this class of foods are included somatose, pemmican, and Mosquera's "Beef Meal." Among the concentrated foods derived from the casein of *milk* are nutrose, eucasein, etc. *Eggs* are dried *in vacuo;* sugar is usually added, and the eggs are then pulverized. Of the *vegetable* proteins utilized in concentrated form are aleuronat and legumin.

2. **Concentrated Carbohydrates.**—Sugar is the most important of the concentrated carbohydrates. In this form, however, it is apt to disagree and cause fermentation. To this class of concentrated carbohydrates belong the malt extracts.

3. **Concentrated Vegetables.**—Many vegetables, such as potatoes, carrots, cabbage, and the like, are concentrated by drying. They are utilized only in those instances in which it is impossible to secure fresh vegetables.

Bread is frequently dried and eaten in the form of "hard-tack," when it is impossible, as during voyages, to obtain fresh bread.

PRESERVATION OF FOOD

By preservation of food is meant the process by which the food is so changed that it can be kept for a longer or shorter period of time without undergoing putrefaction. The process of fermentation is induced by micro-organisms present in the atmosphere coming into

contact with the food and contaminating it. Since putrefactive germs require a certain amount of moisture and heat for their growth, such foods as contain little water and that are not kept too warm are not so likely to undergo decomposition; on the other hand, foods containing much water undergo fermentation very rapidly. To prevent this process four methods of preservation are, according to Yeo,[1] available:

1. Drying. 2. Exclusion of the air. 3. Exposure to cold. 4. Treatment with antiseptic chemic agents.

1. **Drying.**—By this process a large proportion of the water is abstracted. Pemmican is a form of meat preserved by this method. Vegetables, such as carrots, peas, potatoes, etc., are also preserved by drying. Milk, in the form of nutrose, eggs, as egg powder, and fruits are often preserved in this manner.

2. **Exclusion of Air.**—Air may be prevented from coming into contact with food in a number of ways: by immersing the food in oil or fat; by heating the food, so as to evaporate the external layers; by coating with some impermeable substance, as oil, salt, sawdust, varnish, or paraffin. Fish are frequently preserved by immersion in oil or by smoking. Ham and bacon are preserved by smoking, by which process the outer surface becomes coagulated and impermeable. Eggs are preserved by covering the fresh eggs with some impermeable substance, such as oil, fat, beeswax, or sawdust. In order properly to preserve food by exclusion of air it is highly important that the food be perfectly fresh, and that any air that may be present be expelled.

In *canning*, the food to be preserved is heated in tin cans until steamed, when, all the air having been expelled, the can is soldered and rendered air-tight. Various methods have been resorted to, to obviate the necessity of cooking in preserving food. McCall advises the partial exclusion of air and the disinfection of what remains with sodium sulphite. A method of replacing the air by nitrogen and sulphurous acid has also been recommended.

3. **Exposure to Cold.**—Food can be preserved indefinitely by ice. Meat and fish, which are often preserved by this means, should be cooked at once after thawing. Frozen meat loses about 10 per cent. more of its nutritive value in cooking than fresh meat. Frequently food is not kept directly on ice, but in refrigerating chambers; it can thus be shipped many thousands of miles on land or water without showing the slightest tendency to decomposition. The use of cold storage for indefinite periods of time is to be condemned, and storage warehouses should be compelled to brand all stored food as such, as well as with the date of entrance.

4. **Treatment with Antiseptic Chemic Agents.**—Under ordinary

[1] Food in Health and Disease, p. 176.

circumstances the only chemic agents allowable in preserving food are salt, sugar, vinegar, wood smoke, and spices.

Salting.—The salting of food is a method that has been practised for many centuries. In this way meat and fish are easily preserved. The pale color of the meat produced by salting is overcome by adding a little saltpeter in addition to common salt. By salting, considerable proteins are extracted from the meat—according to Liebig, one-third of the nutritive value of the meat is lost in this way. After the salting has been accomplished it is often followed by smoking.

Sugar in strong solution acts as an antiseptic, and fruits are thus often preserved in concentrated syrups.

Vinegar acts as an antiseptic in preserving cucumbers, pickles, oysters, etc.

Spices.—Recent observations have shown that certain spices exert a very marked preservative action. Cinnamon, cloves, and mustard are the most powerful, nutmeg and allspice somewhat less active, while ginger, black and cayenne pepper are ineffective.

Other Antiseptics for Preserving Foods.—Among these substances are sulphur vapor; weak carbolic acid; strong acetic acid; injections of alum and aluminium chlorid into the blood-vessels; boric acid; borax; salicylic acid; formaldehyd.

Chittenden and Gies [1] have studied the effect of borax and of boric acid on the general nutrition. They conclude that, taken in small doses for a long time, borax does not alter metabolism or disturb nutrition. In larger doses borax retards protein and fat assimilation. In very large doses it causes nausea, vomiting, and diarrhea. (See Food Adulteration.) Wiley [2] has made an extended study of food preservatives, and concludes that boric acid and borax used even in small quantities over long periods of time disturb appetite, digestion and the general health. The fact that certain individuals may take small amounts of certain food preservatives for long periods of time without injury is no argument in favor of their use, as we have no method of determining who will be and who will not be injured in this way. Wiley states positively that there is no necessity for using either chemic preservatives or artificial coloring-matter in food-products. Food laws should be enacted and carried out prohibiting the use of coloring-matters, chemic preservatives, and sophistication of every kind.

ARTIFICIAL FOOD PREPARATIONS

To this class of foods belong those preparations that are so concentrated as to furnish a large amount of food in small bulk; being of small bulk, they can be added to liquid foods, and thus the nutritive value of the latter increased without increasing the total quantity

[1] Am. Jour. Physiol., 1898, No. 1.
[2] U. S. Dept. Agriculture, Bull. 84, Part I.

of liquid taken. The Council of Pharmacy and Chemistry of the American Medical Association has demonstrated the uselessness of many proprietary foods inasmuch as when taken alone the patient is receiving a starvation diet and at the same time paying an exorbitant price for the real amount of nutritive matter received. A number of these preparations have been mentioned under the head of beef-juices and meat-powders. The various casein preparations, among which may be mentioned nutrose, eucasein, sanose, and plasmon, are artificial foods.

1. **Nutrose** is prepared from the casein of milk combined with an alkali (sodium), which converts the casein into a colorless, tasteless powder completely soluble in water. It contains from 13 to 18 per cent. of nitrogen, and is used as a food in digestive disturbances. It is administered in soups (one-third to one-half ounce of nutrose to each cupful).

2. **Eucasein** is a similar preparation, in which, however, ammonia enters instead of sodium.

3. **Milk somatose** is a food prepared from milk casein and contains 5 per cent. of tannic acid. It is a yellowish tasteless powder. It is especially useful as an astringent food in intestinal catarrh and dysentery.

4. **Plasmon** is prepared from the proteins of milk, and is a most useful casein product. It is a white tasteless powder, soluble in warm water. It is administered in water, milk, or broths. It contains about 70 per cent. of proteins.

5. **Galactogen** is obtained from milk. It contains 70 per cent. of protein and is especially agreeable as galactogen-chocolate.

6. **Mammala.**—This is pure cow's milk from which part of the cream has been removed and milk sugar added. This is then dried by the Hatmaker process, the result being a yellowish white, fluffy powder with a very faint odor of fatty acids. Mixed with water it forms a fluid very like milk and very easily digested and assimilated. It is useful in feeding infants and invalids where cow's milk does not agree. For invalids one third to three quarters of a glass of mammala and then filled with warm water may be used. For infants a heaping teaspoonful to each ounce of water and in some cases from one quarter to half as much in addition will be found sufficient.

Artificial Proteins made from Meat.—A number of these preparations have already been described. To this class belong: 1. Tropon. 2. Peptone-products. 3. Ferson. 4. Somatose.

1. **Tropon** is prepared both from animal and vegetable protein in the form of a powder containing about 80 per cent of protein. It is best given in broth, milk or cocoa.

2. **Peptone-products.**—Peptone-products are predigested protein foods. When given in large quantities they tend to produce diarrhea, and are objectionable to many patients on account of their disagreea-

ble taste. Among the principal peptone-products manufactured may be mentioned Kemmerich's, Koch's, Benger's, Savory & Moore's, Carnrick's, Armour's Wine of Beef Peptone, and Panopepton.

The following table, taken from König, gives the chemic composition of some peptone preparations:

Preparation.	Water.	Total nitrogen.	Insoluble proteid.	Albumoses.	Peptones.	Other nitrogenous compounds.	Fat.	Ash.
Kemmerich's meat peptone (dry)	33.30	9.78	1.10	14.56	32.57	9.97	0.30	7.73
Koch's meat peptone (dry)	40.16	7.80	1.42	15.95	18.83	15.96	0.79	6.89
Benger's peptonized beef jelly . .	89.68	1.55	. .	2.41	4.75	2.27	. .	0.89
Savory & Moore's fluid beef . . .	27.01	8.77	. .	5.42	2.74	52.73	. .	12.10

3. **Ferson** is ox blood from which the blood corpuscles are separated from the serum, dried in vacuo and powdered. It is an odorless powder containing considerable iron and phosphorus. The preparation is best taken in milk in doses of from 3 to 4 teaspoonfuls a day.

4. **Somatose.**—Somatose is a predigested meat consisting of albumoses. It is a yellowish powder, tasteless, odorless, and highly nutritious, and is usually well borne even in gastric disturbances.

Artificial Proteins prepared from Vegetables.—The two principal forms of this class of foods are as follows:

1. **Roborat.**—This is a vegetable protein manufactured from rice, wheat, and maize. It is a fine, odorless, and tasteless flour, slightly soluble in water. It is well borne by the stomach, and is absorbed about as well as an animal albumin (up to 95 per cent.). It is free from nuclein and does not increase the excretion of uric acid. It may be added to any food, but ordinarily 30 or 40 per cent. of it is mixed with flour and baked.

2. **Legumin** consists of the casein of the legumes, and is a highly nutritious protein food.

3. **Aleuronat** is a brownish powder chiefly utilized as a food for diabetics. It contains 80 per cent. of protein.

Mixed Artificial Food Preparations.—These products are mixtures of proteins and carbohydrates. Of these the following are most important:

1. **Acorn-cocoa** consists of cocoa from which a large portion of the fat has been extracted, and to which an extract of acorns has been added. This preparation is especially useful as an astringent in diarrheas.

2. **Hygiama** consists of condensed milk with the addition of cereals and cocoa and is highly nutritious.

3. **Racahout** is composed of chocolate, sugar and Arabian meal, and is nutritious and agreeable.

ARTIFICIAL PROPRIETARY FOODS.

A large number of proprietary foods, designed as substitutes for milk for infants and invalids, are on the market. Infants fed upon such foods alone are apt to become rachitic. Some of these foods have little food-value, especially the amylaceous foods in which the starch has not been predigested. Many of these preparations contain too little fat and far too great a proportion of carbohydrates. According to Holt, "when children are fed upon foods lacking in fat the teeth come late, the bones are soft, the muscles flabby," while "children fed upon foods containing too much sugar are frequently very fat, but their flesh is very soft; they walk late and they perspire readily about the head and neck." As Halliburton has recently pointed out,[1] "mere chemic analysis is no criterion of food-value, for the digestibility of the food is the all-important question. Investigations into the value of food-stuffs must be conducted and controlled both *in vivo* and *in vitro*—both in the body and in the test-tube. The results of test-tube experiments are of value, but the final test of food-stuffs must be made on animals, and preferably on man. These experiments are both tedious and difficult, but there is a growing appreciation of their value and an increasing resort to their use."

Hutchison[2] divides proprietary foods into three classes:

1. **Foods prepared from cows' milk** with various additions or alterations, and requiring only the addition of water to fit them for immediate use. To this class belong Malted Milk, Nestlé's Food, Lactated Food, Carnrick's Food, Cereal Milk, Wyeth's Prepared Food, and Wampole's Milk Food. These foods are prepared from flour baked and mixed with milk or cream and then dried. By means of the malt which is added the starches are converted into dextrin and maltose. The general composition of these foods is as follows:

	Per cent.
Water	90.0
Protein	1.0
Fat	0.5
Sugar	5.0
Mineral matter	0.5

The chemic composition of Malted Milk and of Nestlé's Food is thus given by Chittenden:[3]

	Malted Milk.	Nestlé's Food.
Water	92.40	92.76
Protein	1.15	0.81
Fat	0.60	0.36
Sugar	5.38	3.80
Mineral matter	0.29	0.13

2. **Farinaceous foods prepared from cereals of which the starch**

[1] "Dietetic Value of Patented Foods," New York Med. Jour., January 23, 1904.
[2] Food and Dietetics, p. 445.
[3] New York Med. Jour., July 18, 1896.

has been partly or wholly converted into dextrin or sugar, and which require the addition of milk to fit them for use. To this class belong Mellin's Food, Savory & Moore's Infant Food, and Benger's Food. These foods are prepared by mixing equal parts of wheat flour and barley malt with bran and potassium bicarbonate. The mixture is made into a paste with water, and kept at a warm temperature until the starch is converted into dextrin and maltose. As these foods are poor in fat, protein, and mineral matters, they are added to milk in order to render them more nutritious.

3. **Farinaceous Foods in which the Starch has not been Predigested.**—To this class belong Ridge's Food, Neave's Food, Imperial Granum, and Robinson's Patent Barley. These foods are poor in fat, protein, and mineral matters.

Cereal gruels, frequently used in infant feeding, are most easily made from prepared flours. They are not always identical in composition, but the following table, showing composition of gruels made from the Cereo Company gruel flours, is instructive:

	Barley.		Legume.		Oat.		Wheat.	
	Proteids.	Carbo. Hydts.	Proteids.	Carbo. Hydts.	Proteids.	Carbo. Hydts.	Proteids.	Carbo. Hydts.
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
1 level tablespoonful flour (¼ oz.) to quart of gruel .	0.12	0.60	0.19	0.53	0.12	0.60	0.10	0.62
2 level tablespoonfuls flour (½ oz.) to quart of gruel .	0.24	1.20	0.39	1.06	0.24	1.20	0.20	1.25
3 level tablespoonfuls flour (¾ oz.) to quart of gruel .	0.36	1.80	0.58	1.59	0.36	1.80	0.30	1.88
1 level coverful flour (1 oz.) to quart of gruel . . .	0.48	2.40	0.78	2.12	0.48	2.40	0.40	2.50
2 level coverfuls flour (2 oz.) to quart of gruel . . .	0.96	4.80	1.56	4.24	0.98	4 80	0.80	5.00
3 level coverfuls flour (3 oz.) to quart of gruel . . .	1.44	7.20	2.34	6.36	1.44	7.20	1.20	7.50
4 level coverfuls flour (4 oz.) to quart of gruel . . .	1.92	9.60	3.12	8.48	1.92	9.60	1.60	10.00

Composition of Proprietary Foods.

(Compiled from Hutchison.)

Food.	Water.	Protein.	Fat.	Carbohydrate.	Mineral matter.
	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
Allenbury, No. 1	5.7	9.7	14.0	66.85	3.75
Allenbury, No. 2	3.9	9.2	12.3	72.1	3.50
Allenbury, No. 3	6.5	9.2	1.0	82.8	0.5
Benger's Food	8.3	10.2	1.2	79.5	0.8
Carnrick's Soluble Food .	5.5	13.6	2.5	76.2	2.20
Fairchild's Milk Powder .	5.54	1.19	0.05	92.0	1.22
Horlick's Malted Milk . .	3.7	13.8	3.0	76.8	2.70
Imperial Granum	11.50	10.91	0.64	5.73	1.0
Mellin's Food	6.3	7.9	trace	82.0	3.8
Nestle's Milk Food . . .	5.5	11.0	4.8	77.4	1.30
Ridge's Food	7.9	9.2	1.0	81.2	0.7
Robinson's Patent Barley .	10.1	5.1	0.9	82.0	1.9

Other Proprietary Foods.—Crackers are prepared from flour, water or milk, and are baked into various forms. Baking-powder and soda, and frequently milk, butter, sugar, and flavoring extracts, are added. Crackers are, as a rule, easily digested.

Malt Extracts.—Malt extracts are manufactured by heating a solution of malted barley at a moderate temperature *in vacuo*. The average composition of malt extracts, as given by Klemperer,[1] is as follows:

	Per cent.
Sugar	50–55
Soluble starch	10–55
Protein	5–6
Ash	1–2

Malt extracts are especially useful as beverages for those weakened by chronic disease, as tuberculosis or anemia, and in the convalescence from acute diseases, as after typhoid fever or pneumonia. Among the various malt preparations may be mentioned Maltine, Kepler's Extract of Malt, and Hoff's Malt Extract.

The following table shows the number of calories per ounce to each of the principal food specialties manufactured by the Battle Creek Food Company:

Products.	Calories per Ounce.			
	Protein.	Fats.	Carbo-hydrates.	Total.
Bran biscuit	21	31	73	125
Breakfast toast	11	28	86	125
Bromose	25	66	46	137
Fruit crackers	13	27	73	113
Gluten meal (pure)	00	00	00	000
Gluten flour (40 per cent)	48	3	46	100
Gluten meal (20 per cent)	24	2	80	106
Gluten biscuit (40 per cent)	48	3	56	107
Granola	16	1	85	102
Health chocolates	1	4	85	90
Graham crackers	12	25	86	123
Granose biscuit	13	1	84	98
Granuto	19	5	92	116
Lacto-dextrin	11	11	110	110
Malted nuts	28	74	51	153
Meltose or malt honey	00	00	86	86
Meltose sweets	6	00	95	101
Nuttolene	14	28	8	50
Oatmeal wafers	14	30	81	125
Protose	23	16	10	40
Toasted rice flakes	9	1	97	107
Toasted wheat flakes	11	4	80	104
Vita bits	16	1	85	102
Whole wheat cream sticks	10	1	89	100
Whole wheat wafers	11	26	85	122
Zwieback	17	4	85	106
"Z. O." (breakfast food)	16	1	85	102

[1] Leyden's Handbuch der Ernährungstherapie.

Saccharin.—Saccharin in small quantities (0.3 gram per day or less) added to food is probably without any deleterious effect. But in quantities greater than this, and especially over 1 gram daily, it is injurious to the human body. Saccharin as a sweetening agent should only be used in diabetes or in other diseases in which sugar is injurious. It should not be added to foods for healthy individuals. It should be borne in mind that saccharin has no food value. For full details concerning Saccharin, see Report No. 94, issued November 15 1911, U. S. Department of Agriculture.

COOKING OF FOODS

The cooking of food is an art practised by all races, savage as well as civilized. Food is cooked to improve its flavor, to soften it so that it can be masticated and more easily digested, and finally to destroy all parasites and disease germs that may be present in the raw food. By cooking, certain flavors are developed, which by their savoriness increase the appetite and the taste for the food. Cooking, moreover, destroys the tough fibrous envelopes that surround many foods, thus permitting the food to be more easily acted upon by the various digestive fluids. Various parasitic organisms present in many foods are destroyed by cooking, and the food thus freed from one of its most dangerous elements. On cooking, the protein in food coagulates; under the influence of dry heat the starches are gradually converted into dextrin, whereas under the influence of moist heat the granules gradually swell until they rupture their envelopes. Sugars by boiling are changed gradually into caramel, which is the source of the odor frequently given off in the cooking of food. When fats are heated, they undergo a change, with the production of free fatty acids, which are often responsible for the odors that exist in the kitchen.

Cooking of Meat.—**Boiling.**—In cooking meats the temperature of the water should not exceed the temperature necessary for the coagulation of the proteins. In order that the meat may retain as much of its flavor as possible it should be immersed in boiling water for a few moments; in this way the protein on the surface immediately coagulates, thus preventing escape of the constituents and so retaining all the nutritive elements in the meat. After this has been accomplished the temperature of the water may be lowered and the process of cooking continued. The broth which is so produced is thin and poor. If a rich, nutritious broth is desired, the meat should be cut into small pieces and placed in cold water, and the temperature gradually increased to 150° F. In this way the nutritious elements of the meat pass out into the broth.

Roasting.—In roasting, the meat is first exposed to a high temperature and afterward cooked slowly; thus the outer layers coagulate at once, preventing escape of the juices. Roasting not only prevents

evaporation of the flavors of meats, but its effect on the extractives develops savory odors and flavors.

Baking.—Baking much resembles roasting, except that by the latter process the heat is applied all round the meat, instead of only to one side.

Stewing.—For this purpose meat is cut into small pieces and placed in a small quantity of water. The water is heated slowly, but not allowed to boil; a certain amount of the nutritious substances thus pass into the water, which then becomes rich, and to which flavoring substances and vegetables are added. Inasmuch as the juice is eaten with the meat, none of the nutritious ingredients is lost.

Brazing.—In this process the meat is placed in a small vessel and covered with a strong liquor of vegetable and animal juices; it is then heated, but not boiled. The tough fibers of the meat are thus loosened and made tender; the meat also becomes impregnated with vegetables and spices present in the juices, which enhances its flavor.

Broiling.—Broiling and roasting are similar processes, except that in the former smaller portions are utilized; the process is thus more rapid, a large surface being exposed to the direct action of the heat.

Frying.—In this process the meat is put into boiling fat, with which it becomes saturated; fatty acids are thus produced, which have a tendency to irritate the stomach and cause indigestion.

Cooking of Fish.—Fish may be boiled, broiled, baked, and fried. Boiled fish is most easily digested. Inasmuch as the flavoring substances are more easily dissolved out into the water and lost, less time should be consumed in boiling fish than in boiling meat. Sir Henry Thompson has shown that even with careful boiling 5 per cent. of the solid matter of fish is apt to be lost; for this reason steaming is often preferable.

EFFECT OF COOKING

The **effect of cooking on meat** is to diminish its watery constituents, thus concentrating and rendering it more nutritious; by this process also the extractives, as well as some of the fats, are partly removed.

Grindley and Majonnier have studied the effect of cooking meat very carefully. They have determined that the chief loss in weight during boiling, sautéing, and pan broiling is due to water removed by the heat of the cooking. In the roasting of meats the chief loss is due to the removal of both water and fat. In pan broiling the losses which take place are very small as compared with the other methods of cooking. When beef is cooked in water, from 3.25 to 12 per cent. of the nitrogenous matter, 0.60 to 37 per cent. of the fat, and 20 to 67 per cent. of the mineral matter of the original uncooked meat may be found in the broth. This nutritive material is not lost in case the broth is utilized with the meat. In roasted meats from 0.25 to 4.55 per cent. of nitrogenous matter, 4.5 to 57 per cent. of

fat, and 2.4 to 27 per cent. of mineral matter present in the uncooked meat may be found in the drippings. Beef which has been used in the preparation of beef-tea or broth has really lost but comparatively little in nutritive value, although much of the flavoring matter has been removed. The longer time meat is cooked, and the higher temperature at which this is done, the greater the loss in water and fat, the larger pieces losing relatively less than the smaller ones. A point of considerable interest is that when meat is cooked in water at 80° to 85° C., placing the meat in hot or cold water at the start, has but little effect on the amount of material found in the broth.

The following table, taken from König, shows the chemic composition of certain meats before and after cooking:

	Water.	Nitrogenous matter.	Fat.	Extractives.	Mineral matter.
Beef, raw	70.88	22.51	4.52	0.86	1.23
Beef boiled	56.82	34.13	7.50	0.40	1.15
Beef roasted	55.39	34.23	8.21	0.72	1.45
Veal cutlets, raw	71.55	6.93	6.38	0.68	1.15
Veal cutlets roasted	57.59	11.95	11.95	0.03	1.43

Effect of Cooking on Vegetables.—The important object in the cooking of vegetables is to rupture the cellulose envelop and so to soften the contained starch-granules. Under the influence of heat and moisture the starch swells and bursts its envelop, forming a paste; this paste, in its turn, expands and ruptures the cellulose envelop; cooking, therefore, renders vegetable foods more digestible.

As has been pointed out, in the cooking of meats a certain proportion of the ingredients is lost. Unlike meats, however, vegetables become more watery in cooking. In this condition they are more easily acted upon by the gastric secretion; on the other hand, the addition of water in cooking so increases their bulk that the motor function of the stomach is apt to be over-taxed.

When food is cooked rapidly there is a tendency to overcook the outer layers and to leave the inner underdone. The better plan, therefore, is to cook food slowly for a longer period of time at a lower temperature. Various appliances are on the market which have for their object the production of a continuous action of a moderate heat, at the expense of as little fuel as possible, the "Aladdin Oven" of Dr. Edward Atkinson [1] is an apparatus of this kind. "It is a simple iron box, closed in front by a door, and having an opening in the top that communicates with a tube to let off any superfluous steam. This box is surrounded by another, whose top and sides are made of non-conducting material, for the purpose of holding the heat. A standard, on which this box is set, and a lamp underneath complete the apparatus." Atkinson claims that ordinarily two pounds of fuel are required for every pound of food cooked, whereas with his oven

[1] Edward Atkinson, The Science of Nutrition and the Art of Cooking in the Aladdin Oven, Boston, Damrell & Upham, 1896.

two and one-half pounds of fuel will cook sixty pounds of food. Canon More Ede, of England, invented a similar apparatus for the cooking of penny meals.[1] He describes his apparatus as follows:

"It consists of a box 3 feet high, 2 feet wide, 1 foot 9 inches deep, with an outer case of sheet iron. The sides and lid are lined with 2½ inches of felt, and inside this, again, is a further lining of tin. Underneath this box, which will hold 30 gallons, are placed two of Fletcher's atmospheric gas-burners. The felt being a non-conductor, nearly all the heat from the gas is utilized, and a comparatively small expenditure of gas suffices to raise the temperature of the contents of the box to boiling-point, or to the heat required for the food which is being cooked.

"When once the desired temperature is obtained, one of the burners can be turned off and the other lowered, when, owing to the prevention of radiation by the felt, it will be found that a merely nominal expenditure of gas will enable the temperature to be maintained for hours, and even when the gas is totally extinguished, many hours will elapse before food cooked will become cool.

"But, except in the case of puddings which require rapid boiling, the cooking is done in an inner pan, which is placed inside the box, and which contains rather more than twenty gallons. The apparatus may be best described as a huge Warren's pot, with the additional advantage that the whole of the inner pan is surrounded by warm water."

DISEASES CAUSED BY ERRORS IN DIET AND BY VARIOUS FOOD-POISONS

Disease may be caused by taking too little or too much food, by a diet that is not well balanced,—that is, does not contain the combination of food-elements in correct proportions,—and by other factors and influences the precise nature of many of which is obscure. It may also be caused by certain poisons or disease-germs or parasites taken into the body with the food or drink. Disease may occasionally be produced by a personal food idiosyncrasy. It is also frequently caused by certain beverages.

The diseases due to the taking of insufficient food are starvation, malnutrition, marasmus, and some forms of anemia. Chlorosis is apt to occur in underfed girls.

Overeating, or the taking of improper food, gives rise to a great variety of diseases, especially in those who have hereditary tendencies to certain diseases. The food, by producing irritation in the alimentary tract, may be the direct cause of disease, as in acute indigestion, diarrhea, and the like. Disease may also be produced by the excessive amounts of food assimilated either being deposited as fat

[1] Cheap Food and Cheap Cooking, London, Walter Scott, 1884.

and causing obesity, or by overworking the organs of excretion, producing degenerations or scleroses. The kidneys, liver, and heart are the organs most likely to suffer, but the nervous system may also be affected. In epileptics attacks may be brought on by overfeeding. Gout, lithemia, and the like are among the diseases caused by a too generous diet. Diseases of the skin, such as acne, eczema, and urticaria, may also have the same causal factor.

Overeating is probably as prolific a source of disease as overdrinking, a fact that is not generally admitted. The commonest effects of overdrinking are the nervous conditions caused by excessive tea- or coffee-drinking, and the all too familiar condition, with its well-known symptomatology, of acute or chronic alcoholism.

Water Intoxication.—In man this is a neglected subject, although some attention has been paid to it recently, especially by Rowntree.[1] That it does not occur more often is doubtless due to the safeguards of satiety, of pyloric control and vomiting if the stomach is distended, and diuresis. As much as 2500 c.c. have been given experimentally in two hours' time and the urine output reached 20 c.c. per minute. Priestley took 2 liters within fifteen minutes and 5,500 c.c. in six hours, during which he passed 5,460 c.c. urine. In typhoid fever from 5 to 12 liters a day have been given without producing untoward symptoms. Miller and Williams gave as much as 10 liters a day to patients with chronic nephritis and hypertension, and this caused an increase in blood-pressure, headache, dizziness, restlessness, chills, fulness of the abdomen, vomiting, dyspnea, cramps in the leg, and a marked increase in weight. On the other hand, like amounts are taken by patients with diabetes insipidus without causing any ill effects. Trousseau records a case where the water intake was 40 liters a day and the urinary output 43 liters each day, with no signs of water intoxication. Larson, Rowntree, and Weir have noted water intoxication in patients with diabetes insipidus where, after the administration of pituitary extract, the patient continued to take the customary quantities, *i. e.*, 8 to 10 liters a day. This resulted in headache, nausea, asthenia, inco-ordination, and staggering gait coming on in a few hours, and in one case there was slight subcutaneous edema. Rowntree conducted extensive experiments, and concludes that in man and animals (dog, cat, rabbit, and guinea-pig) the ingestion of water in excess of the ability of the animal to excrete it leads to water intoxication, which is manifested by restlessness, asthenia, polyuria, frequent urination, diarrhea, salivation, nausea, retching, vomiting, muscle tremor and twitching, ataxia, tonic and clonic convulsions, frothing at the mouth, helplessness, stupor, and coma. Death ensues unless the excessive intake is stopped, and this may follow as soon as four to twelve hours or be delayed for some days. This intoxication is accompanied by increased intracerebral pressure probably due to a

[1] Arch. Internal Med., xxxii, 157, August, 1923.

disturbance of the salt water equilibrium of the central nervous system.

Water intoxication can be prevented, alleviated, or cured by the timely intravenous injection of hypertonic sodium chloride solution. In animals weighing approximately 5 kilograms 50 c.c. of 10 per cent. sodium chloride were used. (See also Sodium Chloride Poisoning.)

Acute food-poisoning is due to the action of bacteria or toxins.

Parasites in Food or Drink.—Quite a number of diseases are communicated to man through either the parasite or its embryo being taken into the stomach with the food or in drinking-water. For a thorough knowledge of these parasites and their effects on the human system the student is referred to the text-books on bacteriology.

The **Amœba coli,** which causes a form of chronic dysentery, is probably taken in with the drinking-water. Its life-history is not definitely known.

Coccidium Oviforme.—The spores, known as psorospermia, have been found in the liver, pleura, and other organs of man. They probably gain entrance into the system from water, green vegetables, or from handling animals such as dogs and rabbits. The life-history of this organism is obscure.

Trichomonas[1] and **cercomonas** are small parasites at times found in the stools.

Distoma hepaticum, or liver fluke, usually infests the gall-duct or the gall-bladder. The embryos are attached to aquatic plants, and hence are believed to be taken in with them or with drinking-water. Several other species are described as occurring in China and in Egypt.

Bilharzia hæmatobia, or blood fluke, is found in the urine. It is a native of Egypt, southern Africa, and Arabia. The embryos are probably taken into the body with drinking-water.

Tapeworm.—Several species of tapeworm have been described. The neck and head of this worm, called the scolex, may become encysted, and the worm is then known as the cysticercus.

Tœnia Solium.—The pork tapeworm is a somewhat rare form, infection usually taking place by means of the embryos present in raw or underdone pork. The embryos are seen in the meat as small white spots, and, from its mottled appearance, the meat containing them is usually called measly pork. Government inspection of meat has done much to prevent infection by this and other forms of parasites.

Tœnia mediocanellata or *saginata* is the most common tapeworm in the United States. Infection is produced through eating raw or underdone beef. There are several other rare varieties:

Tœnia cucumerina or *elliptica,* a very small tapeworm, is found in

[1] For a description of the trichomonas, see Dock, Amer. Jour. Med. Sci., 1896, vol. cxi., p. 1.

the dog and occasionally in man. Its embryos occur in the dog louse.

Tœnia flavopunctata is a form found in Boston.

Tœnia nana and *madagascariensis* are forms occasionally met with.

Bothriocephalus latus is a tapeworm found in the north of Europe, and occasionally in the United States. The larvæ are found in fish. Two other forms, *B. maritima* and *B. mystax*, have been found in man. *B. cordatus*, seen in Greenland, and *B. Cristalus* are other rare forms; the former was found in an immature state in Iceland and the latter usually occurs in cats or dogs.

Tœnia Echinococcus.—This is found in the intestines of dogs. In man it may form single or multilocular cysts. Infection occurs from handling dogs or from eating green vegetables. It is rare in America, but not uncommon in Europe.

Ascaris lumbricoides, or round-worm, is a common parasite whose life-history is unknown.

Oxyuris vermicularis, or pin-worm, a small parasite often found in children, is believed to be taken in with fruit and other raw food.

Strongylus duodenale, also called **Anchylostomum duodenale,** is a parasite attracting considerable attention in America. Formerly but little known in the United States, numerous instances of infection by this parasite have recently been reported. It is a small parasite, from 6 to 10 millimeters long, and is present in the upper part of the intestine. It causes severe anemia. The embryos of the parasite are probably taken in with drinking-water. It is apt to occur in brick-makers, miners, and those following similar occupations.

Filaria Sanguinis Hominis.—This parasite is found in the Southern States, and is probably also taken with impure water. It causes hematochyluria and certain forms of elephantiasis.

Filaria or **Dracunculus medinensis,** or guinea-worm, develops in the cyclops, a small crustacean. The larvæ are probably taken into the stomach with drinking-water. It causes vesicles and ulcers. Cases of infection that must have occurred in America have been described.

Trichocephalus dispar, or whipworm, is found in the cecum, and is about 4 or 5 centimeters in length. It does not, as a rule, cause any symptoms.

Rhabdonema intestinale is a small parasite often spoken of as the Cochin-China diarrhea worm. It is found in the intestines, and causes a form of tropical diarrhea. It has been discovered in many parts of the world.

Milk Sickness (Trembles; Puking Fever).—A disease described by Father Hennepin, in the cattle of the early settlers, and by others. But little has been added since the studies of Graff.[1] It may be transmitted by man by using as food the milk or flesh of infected animals. The incubation period is three to ten days. The symptoms

[1] Amer. Jour. Med. Sci., 1841, 351.

are loss of appetite, headache, muscular pains, nausea, vomiting, drowsiness, tremor, convulsions, or coma. Death takes place in from three to ten days in from 10 to 90 per cent. of cases varying in different epidemics. In the convalescent cases exertion brings on "trembles."

Parasitic Diseases.—Trichiniasis.—This is a disease caused by eating the so-called "measly" pork, or pork infected with *Trichina spiralis.* This parasite measures 1.5 millimeters in length—the female, 3 to 3.5 millimeters, and the embryos from 0.5 to 1 millimeter. The embryos are generally coiled up and encapsulated, and are seen in the voluntary muscles, giving rise to the name mentioned above. The parasite is also found in the rat, and Dock believes that the disease is communicated to the hog by eating infected rats.

When taken into the intestinal canal, the envelop surrounding the embryo is dissolved, and in from three to six days the latter develops into a full-grown trichina. The female produces the embryos by thousands, and these work their way through the intestinal wall and enter into the voluntary muscles, where they may be found several weeks after infection. If they are to be found at all, they are present in the diaphragm, which, owing to its proximity to the intestinal canal, is the favorite site. In the muscles the parasites are surrounded by a zone of irritation, and finally become encapsulated, lime salts being deposited in the capsule. Thus encapsulated, the parasite may live for years. Its presence gives rise to gastro-intestinal irritation, fever, pain, and prostration. There is frequently a picture simulating typhoid. A marked eosinophilia is usually present, and the disease proves fatal in many cases.

Owing to the greater frequency with which raw pork is eaten in Germany, trichiniasis is commoner in that country than in the United States. A temperature of 140° F. kills the parasite, and the only sure way of preventing the disease is to cook all pork. The presence of the parasite is easily detected, and in places where meat is inspected infected meat should be rejected by the Government inspector. Pickling and curing meat may, if the pieces are thin, kill the parasites, but they may survive if the pieces of meat are large.

Diseases from Milk.—Numerous diseases are transmitted through the agency of milk, the cow itself being diseased or subsequent contamination of the milk taking place. The cow may be suffering from diseased udders or from some affection of the mammary gland. The organism most commonly present in infected milk is the streptococcus. Tubercle bacilli may find their way into the milk from a diseased gland or udder. As a rule, it may be stated that if the disease, whatever it may be, is not in the mammary gland or in the udder, it is unlikely that the bacteria which gave rise to the disease will find their way into the milk. It should be borne in mind, however, that milk from a sick cow, even if it does not cause disease directly, is apt to be poor in quality, and is not desirable for food.

Milk infection is most commonly the result of impure milk, made so by improper care and contamination with toxin-producing bacteria. The disease may be the result of toxins formed in the milk, or the bacteria themselves may be the cause of the disturbance. (For details as to the proper care of this food, see the section on Milk.)

Poisons Transmitted in Milk.—Poisonous substances taken in with the food of the animal or administered in sufficient quantities as remedies may be transmitted in the milk and cause symptoms in the consumer. This is not of very frequent occurence. Among the numerous drugs which have been reported as causing poisonous symptoms are: arsenic, lead, copper, mercury, tartar emetic, iodin, atropin, veratrum viride, strychnia, croton oil, and others.

Tuberculosis.—Milk as a cause of tuberculosis has of late years been the subject of much discussion. This discussion was largely the result of a statement made by Koch, in 1901, that bovine tuberculosis could not be transmitted to man, and that the disease as found in man and in animals was due to two different organisms. This statement has not been borne out by facts, and it may with safety be stated that the disease in both man and animals is due to the same organism, although some differences in the disease and also in the organism as found in man and in animals exist. If a cow has tuberculosis of the mammary gland or of the udder, although the disease may not be apparent to the naked eye, the milk will contain tubercle bacilli. If the disease occurs elsewhere in the body, tubercle bacilli are not apt to find their way into the milk. The tubercle bacillus, moreover, does not multiply in milk. Tuberculosis may be produced in man by the same bacillus that causes bovine tuberculosis. Where this has occurred, it has usually been the result of accident, the disease following being of a local nature and of no great intensity. Bovine tubercle bacilli have been found in milk with varying degrees of frequency by numerous observers and it has been estimated by Park and others that some 8 or 10 per cent. of human tuberculosis is due to this type of organism.

Diarrheal Diseases.—The question of diarrheal diseases as caused by milk is of the greatest practical importance. Diarrheal disease is commonest in the warm months, and 97 per cent. of the cases that occur in children are in bottle-fed babies. Where the milk is pure and where proper care has been observed in transmission from the cow to consumer, the disease is rare. Where the milk is impure and is carelessly handled, many cases of diarrhea and death are the result. These diseases may be produced by toxins generated in the milk by the bacteria, or by the bacteria themselves being introduced into the intestinal tract. It is not definitely known just what bacteria gives rise to summer diarrhea. The disease is probably due to different organisms. Recent investigations point to *Bacillus dysentericus* (Shiga) as the organism most commonly present. There is no greater

lesson to be learned in the whole range of milk infections than that *impure milk causes diarrhea.*

Diphtheria.—Diphtheria bacilli may find their way into milk from the milker, who may have the disease in a mild form, or from subsequent contamination. A number of epidemics have owed their origin to infected milk.

Scarlet Fever.—Where epidemics of this disease have occurred as the result of milk infection, they have usually been traced to a case of the disease in a milker's family. Kober tabulated 99 scarlet fever epidemics as follows: disease at dairy or milk farm, 68; persons employed at the dairy either lodged in or had visited infected houses, 6; from infected bottles or milk cans left in scarlet fever houses, 2; employees working while suffering or recovering from the disease, 17; employees acting as nurses, 10; milk stored in or near the sick-room, 3; infected cloth used in wiping cans, 1. In 19 instances the infection was attributed to inflammation of the udder or to puerperal fever in the cow. These outbreaks should be regarded as cases of streptococcus or staphylococcus infection rather than scarlet fever.

Typhoid Fever.—Many epidemics of typhoid fever may be traced to an infected milk supply. Too much stress can not be laid on the importance of investigating dairy farms as a source of typhoid fever epidemics. Kober tabulated 195 epidemics caused by milk. In 67 instances the milk was probably infected by using infected well-water to wash the utensils, and in 16 of these, infected water had been intentionally added to the milk for purposes of dilution. In 7 instances the infection was attributed to cows wading in sewage-polluted water or pastures; in 24 instances the dairy employees acted as nurses; in 10 instances patients suffering with mild attacks continued at work; in 1 instance the milk-cans were washed with the dishcloth used among the fever patients; in 2 instances dairy employees were connected with the night soil service; and in 2 instances the milk had been kept in a closet in the sick-room.

Asiatic Cholera.—This disease may be transmitted through the agency of milk, but the usual mode of infection is through drinking-water.

Milk-poisoning (Galactotoxismus).—In 1885 tyrotoxicon was found in milk, and in 1886 Newton and Wallace reported interesting series of cases of poisoning due to the presence of this toxin in milk. The milk was obtained from a dairy in which the milking was done at midnight and at noon. The noon milk was the one that was poisonous. While still warm it was placed in cans, and delivered to the consumers in the heat of the day. The heat permitted the growth of bacteria which caused the formation of toxin. There have been numerous instances where its presence in milk has caused poisoning.

Vaughan and Novy have also found it in ice-cream and in custard. Shearer has demonstrated its presence in vanilla and lemon ices. Besides tyrotoxicon, other toxins have been found in milk. Vaughan

and Perkins have isolated a toxin, caused by a colon-like bacillus, which produces marked symptoms.

Cheese-poisoning (Tyrotoxismus).—As early as 1827 theories began to be disseminated as to the reason why some cheese, usually apparently unaltered so far as ordinary observation went, should cause poisoning. Hünnefeld and others after him believed it to be due to the fatty acids. Numerous cases were reported and discussed. In 1883 and 1884 about 300 cases of cheese-poisoning were reported to the Michigan State Board of Health. All who ate of the cheese were attacked, and the symptoms varied with the quantity taken, being more severe where large amounts had been ingested. The symptoms were vomiting and purging, with watery stools; the tongue, at first white, then became red and very dry, and there was pain in the region of the stomach. The pulse was feeble and irregular, and in some instances there was cyanosis. Vaughan studied these cases, and found that the poisoning was due to twelve different varieties of cheese, most of which came from one factory. The cheese seemed to differ but little from ordinary good cheese, but if offered to cats or dogs together with good cheese, the animals invariably chose the good. If fed to hungry cats, they would eat it and apparently with no ill effects. The poison was isolated, and consisted of a crystalline, highly poisonous substance, which Vaughan called tyrotoxicon. Tyrotoxicon, however, appears to be a comparatively rare poison, and other toxic substances have been discovered in cheese. Vaughan isolated an albumose; Vaughan and Perkins, two bacilli; and Vaughan and McClymonds, a bacillus of the colon group, all of which were toxic.

Typhoid Fever and Oysters.—Typhoid fever has been transmitted by infected oysters, the oysters having usually been grown very near the outlet of a sewer or on artificial beds. In New Haven, some years ago, thirty students were infected with typhoid by eating raw oysters supplied by a dealer who made a practice of placing the fresh oysters in the river for a day or two after receiving them. Running from his house to the river, near where he had placed the oysters, was a drain-pipe. His daughter had typhoid at the time, and his wife had died of the disease shortly before. Instances have been reported in other countries, but it is not a very common mode of infection.

Poison from Mussels (Mytilotoxismus).—According to Vaughan and Novy, there are three kinds of mussel-poisoning:

1. Where the principal symptoms are gastro-intestinal, and of varying intensity. This form may at times be choleriform (Combé). Death may follow very rapidly—in Combé's case it occurred in two days.

2. The most frequent form is that in which symptoms are principally nervous, coming on shortly after the mussels are eaten. There is a sensation of heat and itching; a rash of an urticarial nature, and sometimes vesicular, appears. There may be dyspnea, and death

may result from convulsive tremors or coma. Death has followed from this form in three days.

3. In the third form the symptoms are those of an intoxication resembling alcoholism followed by paralysis and death. Combé in 1827 reported death as early as three hours after eating the mussels, and others six or seven hours, and still others after longer intervals.

Various theories have been advanced to explain the cause of mussel-poisoning. Brieger has isolated a toxin from mussels which he calls mytilotoxin, which caused a fatal case of poisoning. Further study is needed to decide the question of the toxin principle in the other forms.

Shell-fish taken from filthy water is apt to be poisonous. At Havre, France, cases of poisoning occurred from the eating of oysters taken from near the outlet of a drain from a public water-closet (Pasquier). Various rules for recognizing poisonous shell-fish have been given, but they are not, as a rule, reliable. Shell-fish that is fresh, that has been taken from clean water, and that has been washed with clean water, is generally safe. Kept at a summer temperature, whether cooked or not, it is unfit for food.

Poisoning due to Fish (Ichthyotoxismus).—Fish may be poisonous under various conditions:

(1) Some are always poisonous. (2) Some are poisonous during the spawning season. (3) Some may be infected with bacterial diseases which may cause disease in man. (4) Like other nitrogenous foods, fish may be infected with bacteria which produce toxins.

Kobert, according to Novy and Vaughan, makes the following classification of poisonous fish:

1. Where the fish are supplied with poison glands connected with barbed fins, with which they wound their enemies, like the poison of snakes. These cause prostration, convulsions, and death in man.

2. The genus *Tetrodon,* a Japanese fish which has poisonous ovaries, which are less poisonous in winter, when the ovaries are inactive. Kakké, a disease of Japan and other Eastern countries, is believed to be due to the eating of certain varieties of the *Scombridœ* family. (See Beriberi.)

3. Certain other fish whose flesh and glands are harmless may be dangerous on account of the decomposing substances or corals, etc., on which they feed.

4. Poisoning due to toxins, of which Anrep has isolated two. These are due to the fish being infected with saprophytic bacteria. The symptoms are principally due to involvement of the gastro-intestinal tract and nervous system—nausea, vomiting, diarrhea, prostration, rashes, etc.

In Russia and Germany there are certain fish that, if eaten raw, may produce disease, but that, when thoroughly cooked, are harmless. The cause is probably found in a bacterial disease of the fish.

Meat-poisoning (Kreotoxismus).—Many forms of meat-poisoning have been described, and some have been given special names. Certain diseases the result of direct transmission will be considered separately. The meat of animals that have died of disease of any kind is unfit for food, and the old Mosaic law, "Ye shall not eat anything that dieth of itself," [1] is a good hygienic rule. The Jewish laws concerning what were regarded as clean and unclean meats are set forth in the fourteenth chapter of the book of Deuteronomy.

Acute Food Poisoning.—This whole subject needs further study. What is still called ptomain poisoning, and for which the term "general food poisoning" has been suggested, apparently includes disease due to toxins; disease due to bacteria which produce specific disease in the lower animals, but which, while not producing these diseases in man, cause distinct symptoms; in this class can be mentioned Bacillus suis pestifer, which causes a disease in pigs; B. pullorum, producing diarrheal disease in chickens; B. enteritidis, affecting cattle; B. abortus equi, in horses; B. typhi muri, in mice, and a number of others which need not be mentioned; disease due to B. paratyphoid A and B. paratyphoid B; and botulismus or infection with B. botulinus.

Food poisoning shows a steady increase both in the number of epidemics and deaths. In 1910,[2] 157 deaths were reported in the United States, while in 1920 there were 957. During the period included there were 7,316 deaths. Geiger studied the period between 1910 and 1922 inclusive, during which there were 749 outbreaks involving 5,210 persons, with 399 deaths, a mortality of 7.6 per cent. But it should be noted that out of these outbreaks 48 were botulism, with 172 persons affected, of whom 140 died, a case mortality of 80 per cent. This makes the remainder have a case mortality of only 4.1 per cent. There is always considerable error in diagnosis in the so-called "ptomain poisoning" where the trouble is due to metallic or other poisoning.

There is no particular season for these outbreaks, although the rate is slightly higher in winter than in summer.

The types of food involved is given by Geiger as follows:

	Meat.	Fish.	Vegetables.	Fruit.	Soup.	Milk.
Commercially preserved	38	209	237	38	53	29
Home prepared	45	5	48	9	..	20

[1] OLD TESTAMENT: Deuteronomy xiv:21.

[2] Geiger, Food Poisoning, Jour. Amer. Med. Assoc., October 13, 1923, lxxxi, 1275.

Of the commercially prepared meat products, beef (18) heads the list; of fish, salmon (149), and sardines (35); of vegetables, tomatoes (54), corn (54), beans (49), string beans (30), pork and beans (19), and peas (45); of fruit, peaches (15) and olives (10). Of the home prepared meat products, beef (19), sausage (11), and pork (8); of fish, salmon (3); of vegetables, string beans (15), corn (11), and asparagus (6); of fruit, apricots (4), and peaches (2).

Commercially canned foods from the better establishments are not liable to be infected by the paratyphoid group except in the case of leaky cans or in the case of cans left open. In the years 1910 to 1922 it is estimated that there were 3,500,000,000 cans of American salmon packed, and during this period there were 149 outbreaks attributed to salmon, or one for every 2,500,000 cans.

Approximately 64 per cent. of the outbreaks involved one or two cases, approximately 30 per cent. were family outbreaks, and there were 57 large outbreaks, approximately 7 per cent. Three of these involved over a thousand persons, with no deaths.

The physical appearance of the alleged causative food is important. Often it is stated to have been normal to taste, sight, and smell. In 87 of the above outbreaks the food was said to have been "off" in taste or odor. Of these, 34 were outbreaks of botulism. The food was described as spoiled in 50 instances, bad in 7, not good in 5, and the remainder as peculiar, offensive, putrid, off, and biting.

It is important to note that there is a definite period of incubation of from three to eight hours for general food poisoning and twenty-four to forty-eight hours for botulismus. Where there is no such period the diagnosis is to question or ascribe to food ingested earlier. Geiger gives the following table:

General Food Poisoning.	Botulism.
Incubation Period.	
Usually three to eight hours, rarely over twelve.	Usually twenty-four to forty-eight hours.
Treatment.	
Supportive and eliminative.	Botulinus antitoxin, specific type; absolute quiet; eliminative.
Investigative Procedure.	
1. Use incubation period for basis of determining the causative meal.	1. Use incubation period for basis of determining the causative meal.
2. Always suspect freshly cooked or warmed over foods. Preserved foods are rarely at fault. Foods are apparently O. K. as to taste, appearance, odor, and texture.	2. Always suspect preserved foods; likewise meat products, such as sausages. Spoilage of foods is noted in many instances.
3. Bacteriologic examination of excreta of patients and the suspected food for the paratyphoid group and other organisms.	3. Test of suspected food for toxin by animal inoculation; mice, guinea-pigs, or rabbits. Test for type with specific antitoxin. Culture of suspected food for the presence of spores, particularly if food has been previously boiled.

General Food Poisoning.	Botulism.
Investigative Procedure.	
4. Bacteriologic and epidemiologic search for human carriers and possible contamination from animal sources.	4. Search for domestic animals, such as chickens with symptoms of limberneck, for corroborative field and laboratory evidence.
5. Complications: appendicitis, cholecystitis, persistent elevation of temperature (paratyphoid infection).	5. Complications; bronchopneumonia.
	6. Human outbreaks are usually due to Type A toxin.
Symptomatology.	
Sudden onset; nausea, vomiting, abdominal pain, prostration, diarrhea, and rise of temperature.	Delayed onset; marked muscular weakness; gastro-intestinal symptoms, rare; disturbances of vision, with diplopia and blepharoptosis; loss of ability to swallow and talk; constipation; rapid pulse and subnormal temperature; rarely any pain; death from respiratory failure.
Mortality, 0 to 1 per cent.	Mortality over 60 per cent.
Case infectivity rate high.	Case infectivity rate usually 100 per cent.

Botulism, or sausage poisoning, has been known a great many years, and there have been numerous reports where a few and even a great many persons have been rendered dangerously ill by the ingestion of sausage, particularly blood sausage, and other forms of meat. Botulism from spoiled meat has been reported more frequently from Germany than from America.

There is no special predisposition either in age or sex, those eating poisonous food become ill and, as a rule, all who partake of it are affected, and where any escape there is usually some explanation as to the portion of food infected, although there does not seem to be any reason why some persons should not be more resistant than others. The mortality rate is high, rarely under 50 per cent., and sometimes running close to 90 per cent. The food may or may not have a changed odor, taste, or appearance. Geiger and his associates[1] have made an extensive study of the disease both in man and in animals. The following is largely abstracted from this:

Clinically there are two types. About one-third come on with gastro-enteric symptoms, nausea, vomiting and diarrhea starting soon after the ingestion of the food, lasting twelve to thirty-six hours, and then disappearing on the appearance of the typical symptoms of botulism. In about two-thirds of the cases the nervous symptoms are the first to appear. These usually make their appearance eighteen to thirty-six hours after the food has been eaten, but there are wide variations, and the onset has been recorded as early as two hours or

[1] Public Health Bulletin, 127, September, 1922.

may be delayed as long as eight days. In 74 per cent. of the cases the onset is within forty-eight hours.

The gastro-intestinal symptoms are a burning or distress referred to the stomach, nausea, vomiting, with or without diarrhea. Later there is constipation due to the inhibition of the intestinal movements. There may be distention, but pain, tenderness, or rigidity is rare after the diarrhea stops.

The nervous symptoms are lassitude, dizziness, headache, and a sense of fatigue. Visual disturbances may be the first thing noted or come on early. Scintillation, dimness of vision, and a lack of accommodation for near objects are common. The third nerve is involved, causing blepharoptosis, mydriasis, loss of reflex to light stimulation, and diplopia. Sometimes the pupils are irregular in size and shape. Later there is complete loss of accommodation. The external rectus is frequently weakened. Nystagmus, sometimes one sided, vertigo, and photophobia may be present. Retinal changes are absent.

Coming on at the same time or somewhat later there is a sense of constriction of the throat, with difficulty in speaking and swallowing. The tongue is coated and sluggish in its movements. There may be a paralysis of the pharyngeal muscles, with loss of the pharyngeal reflex. The voice is low, speech difficult, and eventually lost. Attempts at swallowing may cause strangling and fluids may come out through the nose.

There is a general relaxation of all the body muscles and particularly of the neck. The extreme flaccidity suggests paralysis, which is, however, infrequently encountered. There may be inco-ordination and ataxia, but the reflexes usually are present.

The sensory side of the nervous system is rarely affected; apart from the initial headache there is rarely any pain, although numbness of the extremities is occasionally noted. There may be deafness and tinnitus aurium. The mind usually remains clear until a short time before death. There may be restlessness, insomnia, and occasionally attacks of a hysteric nature, but more often there is somnolence and apathy. There may be spells of irritability and great apprehension of approaching death. Coma and convulsions are occasionally noted. There is usually subnormal temperature, but later there may be fever, especially if there is any lung complication. The pulse is slow at the onset, but later becomes rapid. The respiration may be normal early, but becomes labored and often of a Cheyne-Stokes type. There is usually a slight leukocytosis with an increase in the polynuclears, but this may be the result of pulmonary involvement. The cerebrospinal fluid is usually normal, but elevated cell counts have been recorded.

Death is usually due to respiratory or cardiac failure, and usually occurs between the third and sixth day after the spoiled food has been eaten. In 173 fatal cases death occurred in eighteen in forty-eight hours, 1 survived twenty-six days, but 117, or 67.6 per cent., died

between three and six days. In cases which recover the illness usually is at its worst within ten days, but there is a slow convalescence.

There are no characteristic pathological lesions. There is a rather general congestion, with a tendency to scattered hemorrhages.

The diagnosis is confirmed by finding the toxin of Bacillus botulinus from the suspected food, stools, or at necropsies. There are two types, designated as A and B, but occasionally both types may be isolated from the same specimen.

The following food products have been proved or assigned as the cause for various cases of botulism:

Home Canned Products.		Commercially Canned Products.	
String beans	17	Spinach	6
Corn	9	Minced olive relish	3
Asparagus	5	Pickled and bottled ripe olives	7
Apricots	3	Packed beets	2
Pears	2	String beans	3
Spinach	2	Corn	1
Beets	1	Pork and beans	1
Liquor prepared from old home canned products	1	Bottled tomato catsup	1
		Sausage	2
Cottage cheese	2	Cured ham	1
Pickled material and herring	1	Bottled clam juice	2
Cured ham	2	Tuna fish	1
Blood sausage	1	Evaporated milk	1
Cured salted pork	(?)	Prepared minced chicken	1
Beef products	3		

Spoilage due to Bacillus botulinus cannot always be determined by the appearance or odor of the food.

There has been some encouraging work on using an antitoxin.

OTHER FORMS OF FOOD-POISONING.

Mushroom-poisoning.—Poisonous fungi are often mistaken for edible mushrooms, and lead to toxic symptoms. If there is a ring about the stalk and the mushroom peel easily and has pink gills, it is said to be non-poisonous. This rule is not a safe one, since some of the most dangerous forms of fungi answer to this description. The active principle in these poisonous fungi is muscarin or some allied alkaloid. The symptoms produced are vomiting, diarrhea, cramps, and great prostration. The pupils are contracted, and in children there may be convulsions. The treatment consists in emptying the stomach and bowels as promptly as possible, and in giving atropin and other restoratives.

Chestnuts.—Merrill (Journ. Am. Med. Assn., Jan. 24, 1914, p. 289), reports some twenty cases of a toxemia apparently produced by eating chestnuts. Most of the patients were males and young. The symptoms were variable, but included gastro-intestinal disturbance, great prostration and a slow recovery. It is not determined whether the symptoms are caused by the chestnuts having started to germinate

or whether they were in some way rendered toxic through the trees having suffered from the blight.

Grain-poisoning.—There are three forms of grain-poisoning, generally described as ergotism, pellagra, and lathyrism. They are diseases seen almost exclusively among the squalid and destitute, the effects being due to insufficient nourishment combined in each case with the specific poison from the grain. Most cases and epidemics have occurred among the poverty-stricken European peasants. The well-to-do and properly nourished are much less susceptible.

Ergotism (Sitotoxismus).—The history of ergotism is most interesting. It is very probable that many cases of "St. Anthony's fire," described in the twelfth century and later, were cases of grain-poisoning. It is also probable that syphilis and various forms of ulcers and gangrene were confounded with it and with one another. It is not within the province of this book to describe the horrible epidemics of the middle ages, with their wake of mutilations and misery. Within recent years epidemics have occurred in Russia.

Thuillier was the first to discover that the cause of the disease existed in spurred rye. He also pointed out that the rye is spurred in the damp, cold seasons, and that the degree of virulence depends upon the amount of the poison taken. He proved his theories by animal experimentation. Dodart, in 1676, ascertained that ergot was most active when fresh, and that it loses in virulence as it ages. It is produced by a microscopic parasite, known as *Claviceps purpurea,* growing on the rye. The disease is caused by eating the grain on which the parasite has grown. According to Kobert, ergot contains two poisons, sphacelinic acid, which causes gangrene, and cornutin, which provokes the anesthesia and convulsions. The susceptibility of different individuals varies greatly. There are two forms of the disease, one in which gangrene is the prominent feature, and a second in which there are convulsions and anesthesia. An acute and a chronic form of the disease occur. In the gangrenous form there are, at first, tingling, anesthesia, spasmodic movements, and later blood-stasis, followed by gangrene of the extremities. In the convulsive form there are prodromal symptoms, lasting for a week or ten days, consisting of headache, weakness, and tingling sensations. Following these there are cramps in the muscles and convulsions. The spasms may last for hours or days, and are apt to recur. Mental disturbances and symptoms of cord involvement may supervene. The disease should not be mistaken for erythromelalgia, Raynaud's disease, or acrodynia, whose symptoms it simulates.

According to Böttger, ergot may be detected in flour by mixing a small quantity with ether and adding a few crystals of oxalic acid. The mixture is then boiled and allowed to settle and clear. If ergot is present, a red tinge will be imparted to the fluid.

Lathyrism (Lupinosis).—This is a milder form of grain-poisoning,

the poisonous agent being the seed of *Lathyrus sativus* and *L. cicera*, commonly known as the chick-pea. Poisoning occurs from the meal ground from these seeds, which has been used to adulterate flour. The disease was noted as early as the seventeenth century, and was studied by James Irving in India. As the result of the failure of the wheat crop at Allahabad the inhabitants used the chick-pea for food, and an epidemic of lathyrism followed. The disease affects the legs, producing a stiffness of the joints, and may cause a spastic paraplegia.

Potato-poisoning.—Potatoes contain small amounts of an alkaloid, solanin, and sprouting potatoes or those which have been partially exposed above ground may contain sufficient to produce serious symptoms, such as pain, vomiting, diarrhea, jaundice, and great prostration.

Carotinemia.—Some years ago (1904) Von Noorden commented on a discoloration of the skin of diabetes, the color varied from a canary yellow to orange gold. This followed the feeding of carrots, and Moro reported skin pigmentation following the use of carrot soup. Hess and Meyers made the report in America, and the subject has been studied by Head and Johnson.[1]

Carotin and carotinoids are found in many foods and are responsible for the yellow color of the milk fats, egg yolk, and the corpus luteum. Many vegetables contain them, especially carrots, spinach, oranges, and lettuce. There is a great variation in the way different individuals react to carotinoids, and why some should become pigmented and others not is not understood. Mild forms are common in young children; the severe forms are rare, but may occur at any age. It has been determined by a number of observers that in cases of carotinemia the lipochromes are present in an increased amount, and also that the amounts may be varied by changing the diet. The average diabetic diet is rich in carotinoids, and for that reason cases have been reported in diabetics. The pigmentation is harmless and generally disappears slowly on feeding diets containing but few carotinoids.

Chronic Coffee Intoxication.—Roch gives the following description of this affection. The person is usually thin, prematurely wrinkled, the complexion sallow, and there is a tremor of the hands, and usually mydriasis. There is a hesitating or brusque or uncertain manner with involuntary movements and exaggerated reflexes. There is a tendency to neuralgia, there are cardiovascular symptoms and usually a small hard rapid pulse with an increase in the blood pressure. There are also digestive disturbances. This picture is usually not complete. Tea induces similar changes.

Sugar.—It seems possible that unrefined or partially refined sugar products may contain substances that are injurious as suggested by the work of Blosser. Kerley and others have pointed out the fact that

[1] Archives of Internal Medicine, 28, 268, September, 1921.

some children and adults are susceptible to sugar and comparatively small amounts may produce asthma, vomiting, urticaria, eczema, etc.

Phosphorus-poisoning.—It has been recommended that, after acute phosphorus-poisoning all fat be excluded from the diet, on the principle that fat will dissolve any phosphorus remaining in the stomach and so hasten its absorption. For this reason the articles excluded should be not only the butter and other fats, but even milk and the yolks of eggs. The diet should consist chiefly of cereals, gruels, and the like. After several days the ordinary diet may gradually be resumed.

In chronic phosphorus-poisoning Magitot, of Paris, recommends an exclusive milk diet, combined with the inhalation of oxygen, gentle exercise, and repeated small doses of turpentine. If suppuration has occurred, a supporting diet of the most nutritious character, similar to that used for other suppurative conditions, should be prescribed.

Actinomycosis.—This disease is comparatively rare in America. There is no evidence to show that it has ever been transmitted by articles of diet, but cases are recorded where the infection has been traced to barley-sheaths, to grain chewed raw, and to straw being carried in the mouth. The mammary gland, both in cows and in women, may be infected, but so far no case has been traced directly to milk.

Foot-and-mouth Disease.—This disease may be transmitted from infected cattle by means of milk or butter made from the milk of cows suffering from the disease, as well as by direct contact with the animals. The disease was studied as early as 1834, when three German veterinary surgeons drank the milk from infected cows. All developed the disease. Infants and children have also been infected by drinking contaminated milk. The contagious principle is destroyed by heat, but the flesh, milk, and milk-products of animals with foot-and-mouth disease should not be used for food. During epidemics especial care should be taken to avoid the products of such animals, and in case of doubt the milk should be boiled before using.

Hydatid Disease.—Hydatid cysts, caused by the eggs of *Tœnia echinococcus,* may also be classed with the diseases caused by diet. The parasite grows in the small intestine of dogs, and the ova are taken into the alimentary canal of man by drinking water containing them, by handling dogs and carrying the infected hands to the mouth, and by eating raw green vegetables. The disease is rare in America. In the medical wards of the Vienna hospitals a routine question is, "Do you keep dogs, and do you eat green salads?"

FOOD ALLERGY, SENSITIZATION, ANAPHYLAXIS, IDIOSYNCRASY

In former days cases in which food caused manifest symptoms were put down to idiosyncrasy. The symptoms generally caused are

gastro-intestinal, urticarial or eczematous, or else partake of the nature of hay fever or asthma. These conditions need much further study, but there is no doubt that many of them are due to sensitization to food proteins. Just how far these changes are due to the unchanged proteins or to split proteins due to the action of decomposing bacteria or to the bacteria themselves or their toxins has not been worked out. This hypersusceptibility has been described as an unusual or exaggerated supersensitiveness of the organism to foreign substances. This is seen in the sensitiveness of the tuberculous to tuberculin and in the urticarias produced by strawberries, the asthma due to egg white and in many other more or less familiar examples. These symptoms may follow the inhalation of foreign substances, their ingestion, or may be due to bacterial action. Under the first heading comes the hay fever and asthma due to the pollens of plants, the asthmas due to the inhalation of animal products such as that which emanates from cats or horses, probably desquamated epithelium. Under the second heading come the changes which follow the ingestion of grains, nuts, fruits, mollusks, meats, milk, eggs, fish, etc. (See also Walker, Journal Medical Research, 1917, xxxv, xxxvi, and Journal of Immunology, 1917.)

Temporary desensitization or anti-anaphylaxis is observed in human beings just as in animals. After the ingestion of the offending food and a sharp reaction the patient for periods of several weeks or months will not give positive cutaneous reactions, and the food may be eaten without its causing symptoms. Sooner or later the sensitiveness to the food returns. This should be borne in mind in testing patients, for if the patient is tested during this period and no reaction is obtained erroneous conclusions may be drawn. The reactions vary greatly. Schloss [1] gives the following clinical types:

(*a*) The hyperacute type with urticaria, asthma, and symptoms of shock, most often due to milk, egg, or occasionally beef, and less frequently by other foods. The symptoms come on immediately, the most severe, as the shock and asthma, usually subside in an hour or two, and the urticaria usually within twenty-four hours.

(*b*) Bronchial asthma may be due to foods, pollens, epidermis of animals, and bacteria.

(*c*) Urticara is usually but not always due to ingested foods or drugs.

(*d*) Angioneurotic edema may be due to foods.

(*e*) Erythema multiforme is closely related to angioneurotic edema and may be caused by foods.

(*f*) Eczema.—A large number of patients with food idiosyncrasy either have eczema or have had it in infancy, just as a large number of persons with bronchial asthma have or have had eczema. In young infants many eczemas are evidently due to milk, and get better on

[1] The Amer. Jour. Dis. of Children, June, 1920, xix, 433.

withdrawing milk, but the difficulty of feeding an infant satisfactorily without milk prevents its withdrawal entirely. Instead, heated milk, buttermilk, protein milk, peptonized milk, or dried milk may be tried. In some cases other foods seem to be the cause. (See Eczema.)

(*g*) Acute dermatitis may be due to pollens.

(*h*) Gastro-enteric disturbances, as vomiting and diarrhea, are sometimes seen as a result of food sensitization. Raw milk and egg white are perhaps the most common. These children usually may be fed on heated or dried milk.

(*i*) Cyclic disturbances in children are occasionally due to foods, chiefly eggs.

The presence or absence of this sensitiveness may be determined by skin tests which may be made in one of three ways. The foreign material may be introduced on a scarification as suggested by von Pirquet, by using a dental burr or a small jeweler's screw driver or in a linear scarification or by injecting intradermally. The linear cut made into the skin but not deep enough to draw blood is, perhaps, the best as being freer from error and easier to read. The intradermal method is perhaps more sensitive, but more difficult of interpretation. In using the latter the injection must be made into the skin, not through it, and about 0.02 c.c. of solution containing the protein used.

The tests may be made with food substances as by applying white of egg in solution, or fat-free milk, or salt-free butter, or a solution of lactose, or a gruel of the grain or vegetable to be tested. It has been found, however, that it is better to have the protein as free as possible from extraneous matter and to this end extracts of the various food stuffs have been made. These have been placed on the market and render the testing of an individual a comparatively simple matter.

The test is best made on the flexor surface of the forearm and the place should be watched for twenty minutes. The reaction usually appears in five or ten minutes and consists of a marked swelling and redness like an urticarial wheal. It is always well to make control tests as some individuals, especially those with exudative diathesis, may have a little redness and swelling about a simple cut or abrasion. The reaction disappears in from one half to two hours, but occasionally may persist for twenty-four or more. In some there may be itching and if the individual is extremely sensitive there may be more or less marked general symptoms, although this is rare. Occasionally the reaction may be delayed and sometimes the individual has the sensitisation in recurring cycles, so that in negative cases the reaction should be repeated subsequently. This absence of reaction is doubtless due to the fact that in some individuals a severe reaction is followed by a period of variable length during which the sensitiveness is absent.

As a general rule, if a patient reacts to one protein he will react to a number. If he reacts to white of egg he will be found to react to the white of egg of various fowls. If he reacts to nuts he will usually be found to be sensitive to the various nuts. Talbot reminds us not to consider the peanut in this connection, as it is a legume. If the reaction is to one grain it will usually be found to be due to several. There are exceptions, however, and the whole subject needs much more careful study. Schloss made a very careful study of a child who reacted to almonds, oatmeal and egg, but not to other substances.

Individuals who do not give a history of asthma or similar affections, or eczema or urticaria or of gastrointestinal attacks from foods ordinarily harmless will rarely be found to react, whereas a large proportion of persons with such a history will react. There is a distinct tendency for the condition to run in families. The sensitiveness may be inherited or acquired. Thus infants will be found that are sensitive to egg white when it has never been given them before. The intestinal wall of the new born has been found to be pervious to certain proteins and these substances may pass directly through the intestinal wall into the blood and may be demonstrated in the blood and in the urine. This may explain the production of sensitization and it may be that individuals who react are those whose intestinal tracts have been at one time or are pervious to certain food substances.

The substances causing the reaction have been found by Wodehouse to be soluble in water and in the case of vegetables they are not destroyed by heat, while in the case of fruits they are. Thus it is a well known fact that persons in whom raw strawberries may produce severe reactions are not affected by the cooked fruit.

The practical application is to test patients with eczema or urticaria and it is possible that some of the other skin diseases may be found more or less dependent on food sensitization; patients with the history of asthma and allied conditions, recurrent bronchitis, and those with gastro-intestinal symptoms. If the offending substance or substances can be determined they may be eliminated from the diet or an attempt made to desensitize the individual. In older persons very excellent results may be obtained, especially in eczema and asthma. In infants a reduction or removal of the protein from the diet may bring about a great temporary improvement, but as Blackfan has summed it up, "it is impossible to feed an infant for a long time on a diet that contains no animal protein without the risk of seriously affecting his nutrition and because there is a strong tendency for the eczema to return, even though a protein poor diet produces an early improvement and even though the protein poor diet is continued." Fortunately, many cases, both the eczema of infancy and the asthmas of childhood, tend to spontaneous cure with time.

The desensitization may be attempted by feeding the individual very minute amounts of the offending food daily, increasing the amount steadily until large amounts can be taken. The sensitiveness generally returns unless considerable quantities are taken daily.

Schloss suggests giving the food in capsules, so that it does not come in contact with the mucous membrane of the mouth or throat. In children under three years of age, who cannot swallow a capsule, very minute quantities must be used in the beginning, for example, as little as 1/20 drop of milk diluted with water. The increase must be gradual so as not to produce symptoms. From three to six months are needed to effect a desensitization.

Desensitization by means of injecting the purified proteins has also been used. This procedure is perhaps best left to those having experience, as incorrect dosage or spacing of the dosage may lead to marked reactions. Extremely small amounts should be used at first and the injections made not over four days apart, as longer intervals instead of desensitizing will make the individual more sensitive and alarming results follow.

FOOD ADULTERATION

The adulteration of food is a subject of such wide scope that it can not be entered into here in detail.[1] The subject is one of the greatest importance to the community at large; and where legal restrictions do not exist, laws should be enacted which will insure the proper inspection and regulation of the sale of all food-stuffs. The sale of injurious articles should be absolutely prohibited, and adulterated but non-injurious commodities should be properly branded so that the purchaser may not be compelled to pay an exorbitant price for an inferior article. The laws should apply to both native and imported food-stuffs.

In the United States the law enacted July 1, 1903, prohibits the introduction of—(*a*) foods containing substances deleterious to health; (*b*) those misbranded; and (*c*) foods the sale of which is prohibited in the country from which they are shipped.

Almost all the States have enacted food laws of more or less efficiency, but the laws should be sufficiently uniform and stringent to prevent the sale of food-stuffs deleterious to health, and to prevent misbranding. Although under the present law imported articles are pure and properly branded, there are great opportunities, after the articles have entered the country, for the perpetration of fraud; the same is true of native food-stuffs.

[1] For an extended study of this subject the reader is referred to Blyth's book on Foods, and also to the excellent bulletins of the Division of Chemistry of the United States Department of Agriculture. The bulletin on Food Adulteration, known as No. 13, of which some ten parts have already been issued, can be found in all the larger libraries, but, unfortunately, the earlier parts are out of print. It is to be hoped that this bulletin will be reprinted at an early date.

Food adulteration is of two kinds: that which is injurious and that which is non-injurious. The latter is practised where there are no fixed standards, or, where such do exist, in debasements from these fixed standards. Adulterations may be classified as follows:

1. *Conventional*—to suit the taste and demands of the public. Such adulterations are usually effected by means of coloring-matters, many of which are harmful, and by bleaching certain products.

2. *Accidental or incidental*—arising from environment, carelessness, or incompetency on the part of the producer, manufacturer, or his agents. This usually consists in an admixture of some foreign substance, such as husks, stems, leaves, etc.

3. *Arbitrary*—to comply with or take advantage of certain fixed arbitrary standards.

4. *Intentional*—for purposes of gain and competition.

Coloring-matters.—The use of coloring-matter in food is a moot point. We think we can safely assert that the use of any artificial coloring-matter is objectionable, and many of the dyes so used are harmful. Fortunately, the people are being educated by Wiley and his associates, and a demand for pure and uncolored foods is being created.

Alcoholic beverages are frequently adulterated. Wood or methyl alcohol is sometimes substituted for grain or ethyl alcohol. This is especially true of the flavoring extracts, which are used in small quantities. Wood alcohol is an exceedingly dangerous adulterant. Blindness and even death have followed its use. The higher they stand in the series, the more toxic the alcohols become. Hunt has shown that a larger single dose of methyl alcohol than of ethyl alcohol is required to kill, but that the alcohols differ widely as regards their effects with continued use. A quantity of ethyl alcohol somewhat below the lethal dose may be taken day after day without causing death, whereas repeated large doses of methyl alcohol may speedily result in death, the reason being that the end-products of grain alcohol are acetic acid and water, whereas the end-products of wood alcohol are formic acid and water.

Adulterated alcoholic liquors contain fusel oil, tannin, log-wood, water, coloring-matter, and burnt sugar. Various grades of cheap whisky and brandy are manufactured by unscrupulous rectifiers by mixing newly made alcohol with coloring and flavoring matters. An imitation of gin is frequently made from cheap spirits, turpentine, sugar, and water.

The Adulteration of Beer, Wine, etc.—*Wine* and *beer* are sophisticated by the addition of various substances usually added as preservatives. Chief among these is salicylic acid, which is added to arrest the action of ferments. Its use is forbidden in France and Germany, although in the latter country it may be added to beers that are to be exported.

Gerard found that, in a liter, wine contained 1.95, 1.60, 1.48, 1.41, 1.35, 0.81, and in one case as much as 3.5 grams of salicylic acid; syrup contained in the same quantity, 0.50–1.50 grams; beer, 0.25–1.25 grams; milk, 0.25–1.85 grams. In one case it will be noted that a liter of wine contained a full twenty-four hours' dose of salicylic acid.

Crampton found salicylic acid in about one-third of the samples of American bottled beer which he examined. He did not find any in draft beer. Sulphurous acid is one of the oldest of preservatives. Its use is forbidden in both France and Germany. Borax is frequently used, and is also forbidden in the countries mentioned. Sodium bicarbonate is used in beer to correct the acidity caused by improper brewing, and also to cause an increase in the carbonic acid content, so that the beer will have a better "head."

Wine is adulterated by adding sugar, gummy substances, coloring-matters, and salicylic acid and mineral acids as preservatives. In France wine is frequently *plastered* by the addition of gypsum, or calcium sulphate. As Crampton says: "The sulphuric acid of the lime salts replaces the tartaric acid which is combined with potash, and forms an acid sulphate of potash, while the tartaric acid separates out as a tartrate of lime." This gives the wine a brighter color, clears it, and makes it keep better.

Adulterated beer may contain burnt sugar, licorice, treacle, quassia, coriander, caraway seed, Cayenne pepper, soda, salicylic acid, salt, carbonic acid (artificially introduced), grains other than barley, glycerin, glucose, water (added by retailer), tobacco, and Cocculus indicus.

Cider is frequently adulterated by the addition of water and preservatives, and is also manufactured artificially.

Many of the *liquid malt extracts* are merely beers, and most of them have little or no diastasic action; they have no special food-value, nor do such extracts aid digestion. Some are adulterated and harmful.

Liqueurs are frequently adulterated and imitated, and may contain injurious coloring-matter. Maraschino and crême de menthe cherries may be colored with anilin dyes, and they sometimes contain an astonishing amount of coloring-matter.

Tea.—Under the present law teas imported into the United States are practically free from adulteration. Many inferior teas are sold, however, and their sale is not restricted. Tea may be adulterated by mixing exhausted or foreign leaves with it, and adding coloring-matter and astringents. "Facing" is sometimes practised, and consists of treating the leaves with plumbago, indigo, or Prussian blue, the object being to make an inferior tea resemble a better product. The small amount of the adulterants used is not injurious, and the adulteration is easily detected.

Coffee.—Green and roasted coffee may be imitated. An inferior grade of coffee is frequently branded and sold as a better article, and roasted coffee may be adulterated by the addition of too much glazing. Ground coffee is frequently adulterated, and may contain little or no coffee. Chicory is the commonest adulterant.

Cocoa is frequently adulterated by adding starch, sugar, clay, brick-dust, coloring-matter, and flavoring materials. The cocoa-butter may be extracted and tallow or other fats and oils substituted.

Flour is adulterated by adding other grains before grinding or by mixing other flours of an inferior grade or from a different grain. In the United States the sale of "mixed" flours is regulated by law. The mixer must pay a special tax, and the product must be correctly labelled. Various mineral substances have been found in European flours, but such adulterants are seldom used in the United States.

Bread.—This has been adulterated by the use of inferior flour, and by the addition of other substances. Instances have been reported of the use of sulphate of copper and of ammonium, and alum is also used. In foreign countries soap and gypsum have been used, and stannous chlorid has been added to bread made from an inferior flour, for the purpose of making it resemble that made from a better quality.

Butter.—This may be adulterated with oleomargarin, butterin water ("stretched butter"), lard, cotton-seed oil, beef suet, and olive oil. Butter and oleomargarin have about the same composition, and possess about equal digestibility, with the balance slightly in favor of butter. Oleomargarin is not injurious, but to prevent fraud should be correctly labelled.

Lard.—This may be adulterated with stearin, cotton-seed oil, and water. The adulterants are usually harmless.

Olive oil.—This is frequently adulterated with cotton-seed oil, etc. Foreign oils are not so commonly adulterated as formerly, but foreign labels are frequently placed on impure oils, the labelling being done in the United States.

Confectionery is sometimes sophisticated with tartaric acid, glucose, starch, soapstone, and other substances. Injurious coloring-matters may be used.

Spices.—These, particularly the ground spices, are frequently adulterated. Black pepper has been extensively adulterated with a large variety of substances.

Honey.—After being extracted, honey is sometimes adulterated with glucose or cane-sugar syrup. This is not practiced to as great an extent as commonly supposed, and pure extracted honey may be bought in the open market. Comb honey cannot be made without the aid of bees. A thin sheet of beeswax, in which there are hexagonal impressions corresponding to the bases of the cells, called comb foundation, is used very extensively to bring about greater uniformity in the size of the cells, and also to lessen the labor of the bee. In Europe

it is said that cerasin and paraffin are used for this purpose. They cannot be successfully employed in America, however, and bee-keepers state that the use of these waxes is impossible. Honey may contain poison. Plugge found that the honey from *Rhododendron ponticum* is poisonous, and Xenophon, in his Anabasis, describes attacks of intoxication due to eating honey. Although death seemed near, none of his soldiers were killed by it. Strabo and Dioscorides both speak of honey as producing madness or melancholia. In Abyssinia honey from the cusso tree is used as an anthelmintic. The honey from gelsemium is also poisonous. In Branchville, S. C., twenty persons were made ill and three died from eating honey derived from this source. In New Zealand honey from the "whauriki," a cresslike plant, causes severe symptoms and sometimes death.

Glycerin.—This is adulterated with glucose and water.

Infant Foods.—These are frequently adulterated, many of them being merely cereal mixtures for which an exorbitant price is charged.

Baking-powder.—Starch in large quantities is often added to baking-powder. Alum may be added in place of cream of tartar; but if the powder is correctly labelled, and the addition is allowed by the state law, it is not to be considered an adulterant. Mallet regards alum baking-powders as injurious. This is an open question.

Canned Vegetables and Meat.—These frequently contain substances deleterious to health. Copper and zinc, especially the former, may be used to color peas. Lead, tin, and zinc may be present as the result of unintentional contamination. Lead may gain entrance from the solder, which is frequently used in large quantities and allowed to drop into the can. Lead-stoppered bottles are also sometimes used, and account for the presence of lead in the food. Metallic lead is objectionable, and the presence of lead salts is highly injurious. There are two kinds of tin plate used in the manufacture of cans—the "bright," in which pure tin is used, and the "terne," in which a mixture of lead and tin is used. This latter is employed for roofing purposes, although it is sometimes wrongly used for cans. Preservatives, such as sulphurous acid, salicylic acid, boric acid, and others, are frequently added to canned foods.

Preservatives.—Various chemicals are mixed with foods to preserve them. In many countries the addition of such preservatives is forbidden by law. Sometimes only one preservative is used, but often mixtures of two or more are added in combination. Borax and boric acid are the most frequent combination. These substances, together with sulphurous acid, sulphites and sulphates, salicylic acid, benzoic acid, and formaldehyd, are most frequently employed. A large number of other chemicals are used, chiefly to evade laws that forbid the use of the drugs just mentioned. It may safely be stated that the addition of any chemic preservative to food is undesirable. There

are differences of opinion regarding the actual effects of the various preservatives upon the human body.

Borax and **boric acid** as preservatives are the subject of numerous conflicting opinions. It is possible that some of the favorable opinions have been issued by those who draw their salaries and their opinions from the same source. While it is stated by many that the use of these chemicals is not injurious, there are instances on record where they have caused severe symptoms and even death. Boric acid and borax may, however, find their proper use in preserving meats, such as hams, for exporting purposes. Meat sprinkled with borax or boric acid does not become slimy, as it does without it. Before the meat is used, the boric acid should be washed off. The German Government has expressly forbidden the use of such powders on meats imported into that country. This restriction may, however, have been inspired by the Agrarian party, and not by consideration for the public health.

Wiley [1] concludes as the result of his experiments that boric acid and borax should not be used except where preservation is a necessity, and where it has been shown that other methods of preservation cannot be employed. Articles containing boric acid or borax should be properly branded for the protection of the young, the sick, and the debilitated. Large doses (4 or 5 grams a day) cause loss of appetite and of ability to perform work; moderate doses (3 grams a day) cause symptoms, but the subjects are able to continue work for some time; small doses (½ to 2 grams) may be taken for a limited time without result, but unfavorable symptoms are produced in some cases. "It appears, therefore, that boric acid and borax, when continuously administered in small doses for a long period, or when given in large doses for a short period, create disturbances of appetite, of digestion and of health."

Harrington [2] has shown that boric acid may be the direct cause of subacute and chronic nephritis. Food preserved with these drugs is therefore especially injurious to individuals suffering with Bright's disease.

Sulphite and **bisulphate of sodium** are used for preserving all sorts of food, and especially for preserving the color of meats. Their use is regarded as dangerous, and has been prohibited in Germany.

Sulphurous acid is frequently used, especially for preserving wines. In some countries a certain amount of sulphur is allowable in wine, but the amount is often exceeded. It is also widely used in preserving the color in dried fruits.

Salicylic acid is widely used as a preservative. It is exceedingly powerful, and is used only where the taste of the article is not im-

[1] Results of Borax Experiments. Circular No. 15, Bureau of Chemistry, United States Department of Agriculture.

[2] American Journal of Medical Sciences, September, 1904.

paired, as in beer, malt extracts, preserved fruit and the like. In some instances the amount of salicylic acid contained in food to be eaten by one individual in twenty-four hours has been found to equal the maximum medicinal dose prescribed for the same length of time. It is undoubtedly highly objectionable, and its use should be prohibited. It inhibits digestion and irritates the kidneys; food preserved with salicylic acid is especially injurious in cases of Bright's disease.

Formaldehyd is frequently used for preserving milk. As it hardens meats, it is not usually employed as a meat preservative. In general, it may be stated that the use of formaldehyd as a preservative is undesirable and dangerous. Attempts have recently been made to show that in milk very small amounts, 1: 100,000 and less, would inhibit the growth of bacteria, and at the same time not be prejudicial to health, even to that of infants. According to Vaughn, formaldehyd in the proportion of 1: 25,000, or 1: 50,000, retards the growth of the lactic acid bacillus, and thus delays the souring of milk, while it has but little effect on the multiplication of the colon and typhoid bacilli. It removes the danger signal without removing the danger. Such use of formaldehyd should be prohibited, as it might lead to the use of milk which, while sweet, might still be laden with disease-producing bacteria.

Hydrogen peroxid is used to a slight extent, and is probably the least injurious of all preservatives.

Metallic Poisons and Food.—Small amounts of metals or their salts may find their way into food. The metallic salts are highly injurious, and may produce either acute or chronic poisoning. Many cases of lead-poisoning are traceable to contaminated food.

Lead has been considered in connection with canned goods.

Copper may be added intentionally as a coloring-matter or it may gain entrance from the use of copper or brass kettles.

Nickel is sometimes used to color green peas, and may be found in food cooked in nickel vessels. In the latter event the amount found is so small that it may practically be disregarded.

Zinc is sometimes found in food, especially in dried apples. It owes its presence to the galvanized iron racks upon which apples are frequently dried. The amount present is, however, so small as to be unimportant. Zinc may also enter food from certain kinds of solder, but these are now rarely used.

Arsenic may be introduced into food in various ways. The articles most liable to contain it are beer, malt extracts, syrups, and foods containing glucose or vinegar. In the widespread occurrence of arsenic-poisoning, in Manchester, over 6,000 persons were affected, and over 100 died. The poisoning was caused by drinking beer which contained arsenic derived from impure sulphuric acid used in the manufacture of brewing sugar or glucose. In other localities the

arsenic has been found to be contained in the malt which had been dried in kilns heated by burning arsenical gas-coke.

The table on p. 242 as presented by Prof. Sharpless,[1] gives the food articles likely to be adulterated.

SIMPLE TESTS FOR DETECTION OF PRESERVATIVES.

The following tests, largely adopted from Bigelow and Howard's article, will be found of use in detecting the more important commercial preservatives, with the exception of sulphites and fluorids. The sulphites are used in meats and the fluorids in fruit, and the methods for determining their presence are not suited for household use.

Salicylic Acid.—This is very commonly used in all kinds of foods, solids, and liquids, especially fruit products. It is best detected in solution, and solids and semisolids should be macerated in water and then strained through a white, cotton cloth. Two or three ounces of the fluid to be tested is used, adding to it a few drops of sulphuric acid (or about 15 grains, the quarter of a teaspoonful, of cream of tartar). Shake thoroughly and filter. To the clear liquid add three or four tablespoonfuls of chloroform, mix by a rotary motion, but do not shake, or an emulsion will be formed, which is difficult to break up. Allow the chloroform to settle and remove as much as possible by means of a pipette or medicine-dropper. This is placed in a test-tube with an equal amount of water and a small piece—a little larger than a pin head—of iron alum. Shake well and allow to settle and if salicylic acid is present the upper layer will have a purple color.

Benzoic Acid.—This is used chiefly in fruit products, catsup, etc. This test is not sufficiently delicate for very small quantities, such as may be added to wine. Proceed as above. Evaporate the chloroform by placing in a saucer outside of a closed window. In cold weather place the saucer in a basin of rather warm water. When the chloroform has evaporated the characteristic flat crystals of benzoic acid may be seen in the saucer, and, on warming, the characteristic irritating odor of the acid can be detected.

Borax and Boric Acid.—Both of these are used in many food products. Macerate solids or semisolids as above, cool the liquid, and filter through filter-paper.

In testing butter, place a heaping teaspoonful in a cup, add a couple of teaspoonfuls of hot water, stand the cup in hot water until the butter is melted, stir well, then put the cup in cold water until the butter solidifies, and then filter the liquid.

For milk, use an ounce of milk and two ounces of solution of a teaspoonful of alum to a pint of water. Shake well and filter.

Add five drops of hydrochloric acid to a teaspoonful of the liquid,

[1] From Bulletin No. 25, Division of Chemistry, United States Department of Agriculture.

Articles.	*Leleterious adulterants.*	*Fraudulent adulterants.*	*Accidental adulterants.*
Arrow-root.		Other starches which are substituted in whole or in part for the genuine article.	
Brandy.		Water, burnt sugar.	
Bread.	Sulphate of alum.	Flours other than wheat, inferior flour, potatoes.	Ashes from oven, grit from millstones.
Butter.	Copper.	Water, other fats, excess of salts, starch.	Curd.
Canned vegetables and meat.	Salts of copper, lead.	Excess of water.	Meat damaged in the process of canning.
Cheese.	Salts of mercury in the rind.	Oleomargarin.	
Candy and confectionery.	Poisonous colors, artificial essences	Grape-sugar.	Flour.
Coffee.		Chicory, peas, rye, beans, acorns, chebus-nuts, almond or other nut-shells, burnt sugar, low-grade coffees.	
Cocoa and chocolate.	Oxid of iron and other coloring-matters.	Animal fats, starch, flour, and sugar.	
Cayenne pepper.	Red lead.	Ground rice flour, salt, ship-bread, Indian meal.	Oxid of iron.
Flour.	Alum.	Ground rice.	Grit and sand.
Ginger.		Turmeric, Cayenne pepper, mustard, inferior varieties of ginger.	
Gin.	Alum salt, spirit of turpentine.	Water, sugar.	
Honey.		Glucose, cane-sugar.	Pollen of various plants and insects.
Isinglass.		Gelatin.	
Lard.	Caustic lime, alum,	Starch, stearin, salt.[1]	
Mustard.	Chromate of lead, sulphate of lime	Yellow lakes, flour, turmeric, Cayenne pepper.	
Milk.	Water.	Burnt sugar, annatto.	Sand, dirt.
Meat.	Infested with parasites.		Tainted.
Horse-radish.		Turnip.	
Fruit-jellies.	Anilin colors, artificial essences.	Gelatin, apple-jelly.	
Oatmeal.			Old and wormy.
Pickles.	Salts of copper, alum.		
Preserves.	Anilin colors.	Apples, pumpkins, molasses.	
Pepper.		Flour, ship-bread, linseed meal.	Sand.
Sago.		Potato-starch.	
Rum.	Cayenne pepper, artificial essences.	Water.	Burnt sugar.
Sugar.	Salts of tin and lead, gypsum.	Rice-flour.	Sand and dirt, insects dead and alive.
Spices.		Flour, starches.	
Cloves.		Arrow-root.	
Cinnamon.		Spent bark.	
Pimento.		Ship-bread.	
Tea.		Foreign leaves, spent tea, plumbago, gum, indigo, Prussian blue, China clay, soapstone, gypsum.	Ferruginous earth.
Vinegar.	Sulphuric, hydrochloric, and pyroligneous acids.		
Wine.	Anilin colors, crude brandy.	Water.	Sulphate of potassium.

dip a piece of tumeric paper in it, and dry the paper. If either borax or boric acid is present, the paper when dry becomes a sherry red. A drop of ammonia turns the color dark green or greenish-

[1] It was evidently an oversight to have omitted cotton-seed oil and water.

black. If too much acid has been used the color may first be brown, even if borax or boric acid is present. The ammonia turns this brown just as it will turn turmeric paper, which has not been dipped in acid solutions.

Saccharin.—Proceed as in the test for salicylic acid. The residue left on evaporating the chloroform has the sweet taste of saccharin. Sugar is not soluble in chloroform, so will not be present. If tannins are present the astringent taste may mask the taste of the saccharin.

Formaldehyd.—This must be separated by distillation in foods other than milk. For milk test, see chapter on milk.

THE DETERMINATION OF ARTIFICIAL COLORS

The Coal-tar Dyes.—If the substance to be examined is not a liquid, dissolve the dye by macerating it in water. Filter, take two or three ounces and add a few drops of hydrochloric acid and a few strands of white woolen yarn or pieces of white woolen cloth. (Before using, the wool should be boiled in water containing a little soda, to remove any fat it may contain, and then washed in water.) The wool which has been boiled is washed first in hot and then in cold water, and the water pressed out. If the wool is not discolored, the substance tested may be regarded free from artificial colors. If the wool is colored it may be from coal-tar colors, some foreign vegetable colors, or, if a fruit is being examined, the natural coloring-matter of the fruit. Rinse the wool in hot water and boil three minutes in two ounces of water to which two drams of ammonia have been added. Squeeze out the excess of water. Natural fruit color is retained, while the coal-tar dyes are usually dissolved in the ammonia solution. Add hydrochloric acid to this fluid until the odor of the ammonia has disappeared and the liquid has a sour taste. A fresh piece of woolen yarn is boiled in this, and if it is colored, the substance examined has been artificially colored. Dull faint tints must be disregarded. If an anilin dye (coal-tar) has been used, the yarn will usually be turned purple or blue by ammonia.

The Detection of Copper.—This is often used in coloring canned peas, beans, etc. Mash the substance to be examined and add a teaspoonful of the pulp to three teaspoonfuls of water and thirty drops of hydrochloric acid. Place the cup in which this has been placed in a water-bath (saucepan containing water will do) and add a bright iron wire nail. Boil hard twenty minutes, stirring frequently with a splinter of wood or a glass rod. If copper is present in any appreciable amount the nail will be plated with copper.

Turmeric.—This is added to yellow spices, especially mustard and mace. Mix one-half teaspoonful of the substance to be examined in a white china dish with an equal amount of water and five or ten drops of ammonia. If turmeric is present, a brown color is formed. If an insufficient amount of the dye has been used to give this test, a more delicate one is to mix a teaspoonful of the substance to be

examined with an ounce of alcohol and then allow it to settle fifteen or twenty minutes. About one-half ounce of the upper liquid is placed in a dish with five drops of concentrated solution of boric acid or borax, 10 drops of hydrochloric acid, and the solution thoroughly mixed. A wedge-shaped strip of filter-paper two or three inches long, an inch wide at the upper end and one-quarter inch at the lower end, is then suspended so that the lower end touches the solution. The paper should not touch the side of the dish. This should be allowed to stand for a couple of hours, and if turmeric is present, a cherry-red color forms on the filter-paper near the upper edge. This red color is turned dark green or almost black on the addition of ammonia. If too much hydrochloric acid has been added, a brownish color results.

Caramel.—This is used to color vinegar and other fluids. It should be borne in mind that caramel occurs naturally in malt vinegar. Place about one ounce of the fluid to bé tested in two test-tubes, add a teaspoonful of fuller's earth to one and shake vigorously two or three minutes. Filter through filter-paper. The first part of the liquid coming through the paper should be returned to be filtered a second time. If the filtered liquid on comparison with the untreated test-tube is markedly lighter in color, one may assume that the color of the liquid is due to caramel, which is largely removed by the fuller's earth. This test requires a certain amount of practical experience before results can be depended upon.

THE EXAMINATION OF VARIOUS FOODS

Coffee.—The difference between ground coffee and that which has been adulterated can often be told by the naked eye, especially if not very finely ground. Pure coffee has a uniform appearance, with dull surfaces, while most of the substitutes, particularly peas and beans, have polished surfaces. Chicory is very dark and gummy looking and the particles have a distinctly astringent taste. On placing ground coffee in a bottle half full of water, shaking it and allowing it to stand, a large amount of the coffee will float, while most of the substitutes sink at once to the bottom. The chicory particles will color water, and as they sink slowly to the bottom leave a little dark train behind them. Coffee contains no starch, while all of the substances except chicory used for adulteration contain a considerable amount. All ground coffee that gives a starch reaction may be considered as adulterated.

Flavoring Extracts.—Vanilla and lemon are the most commonly used and most adulterated. They are frequently made with the extract of the tonka bean, which can be determined by the peculiar odor by any one familiar with the two products. The extract made from the artificial vanillin lacks the resins. Caramel is often added to color it, and may be detected by shaking; the foam of pure ex-

tracts is colorless, and if caramel is present, little points of color will be seen at the point of contact with the bubbles. The fuller's earth test, given above, may also be used. To examine for the presence of resins, the extract should be evaporated, and when it reaches one-third its volume the resins become insoluble and settle to the bottom, while artificial extracts remain clear. If water is now added, the resin will separate out in a brown precipitate. A few drops of hydrochloric acid should be added, the liquid stirred and then filtered; the resin left on the filter-paper should be washed with water and then dissolved in a little alcohol, and to one part of this add a few drops of hydrochloric acid and to another a small particle of ferric alum. The resin from the vanilla bean has only a slight change of color, while with most other resins one or both of these reagents yield a distinct color change.

Lemon extract may be tested by placing a teaspoonful of the oil in a test-tube and adding two or three teaspoonfuls of water. With real lemon extract the fluid first becomes turbid and later the oil of lemon separates on the top of the water. If it remains perfectly clear, it is a low-grade product and contains very little if any oil of lemon.

Spices.—The detection of adulteration in spices, for the most part, requires expert knowledge of chemistry and microscopy. Most of the substances used contain starch, but so do most of the common spices. Cloves, mustard, and cayenne pepper are practically free from starch, and the presence of it may be taken as a proof of adulteration. To test for starch, one-half teaspoonful of the suspected spice should be stirred into one-half cup of boiling water and boiled for several minutes and then cooled. If the fluid is of very dark color it should have water added to it, and to this a single drop of iodine is added. If starch is present it gives the characteristic deep blue color, and if very much is present it turns black. If no blue color appears, the iodine should be added drop by drop until it shows in the solution.

Vinegar.—The simplest test is the odor. If it is not apparent the glass should be rinsed out with the vinegar and allowed to stand for some hours, when the odor of the residue will be quite distinct; cider vinegar having the fruit odor and wine vinegar the odor of wine. The residue may also be obtained by evaporation. If the vinegar has been colored, the caramel can be tested by the fuller's earth test. It should be borne in mind that many of the vinegars made from spirits and wood have apple jelly added to give them the characteristic odor.

The Halphen Reaction for Cottonseed Oil.—Carbon disulphide, containing about 1 per cent. of sulphur in solution, is mixed with an equal volume of amyl alcohol. Equal volumes of this reagent and of the oil to be examined are mixed and heated in a bath of boiling

brine for fifteen minutes. In the presence of as little as 1 per cent. of cottonseed oil an orange or red color is produced which is characteristic. Lard and lard oil from animals fed on cottonseed meal will sometimes give a faint reaction.

DIET AS A MEANS OF DIAGNOSIS

Test-meals are given to determine the functional disturbances of the stomach, and to ascertain whether or not pathologic conditions exist. There are many forms of test-meals and they serve various purposes.

Test-meals Employed to Stimulate the Gastric Secretion for the Purpose of Determining the Secretory Function of the Stomach.—1. **The Test-breakfast of Ewald and Boas.**—This consists of a roll or a slice of wheat bread (35 to 70 gm.) and 400 c.c. of water or tea without sugar or milk, taken in the morning on a fasting stomach. The contents of the stomach are removed one hour afterward, or at varying intervals for the fractional analysis according to the method of Rehfuss.

2. The **test-dinner of Riegel** consists of 400 c.c. of soup, 200 gm. of beefsteak, 60 gm. mashed potato and a roll, (35 gm.), and a glass of water (300 c.c.), taken at noon. The stomach is emptied of its contents in from three to four hours.

3. **Test-meal of Germain Sée.**—This consists of 60 to 80 gm. of scraped beef and 100 to 150 gm. of wheat bread. The contents are removed after two hours.

4. **Test-meal of Klemperer.**—Klemperer gives ½ liter of milk and 70 gm. of wheat bread and empties the stomach two hours afterward.

5. **The Double Test-meal of Salzer.**—This consists of 40 gm. of beef scraped and boiled; 250 c.c. of milk; 50 gm. of boiled rice, and 1 soft-boiled egg. This is followed in four hours by an Ewald test-meal, and the contents of the stomach are withdrawn one hour after.

6. **The Oatmeal Test-breakfast of Boas.**—This breakfast is composed of a plateful of oatmeal broth prepared by boiling down to ½ liter 1 liter of water to which a teaspoonful of oatmeal and a pinch of salt have previously been added. This test has for its object the determination of lactic acid, inasmuch as lactic acid is present in all ordinary breads utilized for test-meals.

On account of its simplicity, the Ewald-Boas test-breakfast is most useful, although occasionally a Riegel dinner is found preferable; the only objection to the latter lies in the fact that in withdrawing the stomach-contents bits of meat that may not have been thoroughly digested are apt to obstruct the passage of the contents through the tube. In examining for lactic acid the Boas oatmeal test is preferred. (For a description of the various methods of examining the contents of the stomach for acid, ferments, etc., the reader is referred to the text-books on diseases of the stomach and on clinical diagnosis.)

Dietetic Tests for Determining the Motor Power of the Stomach.—1. **Method of Leube.**—This test consists in having the patient take 400 c.c. of soup, 200 gm. of beefsteak, 50 gm. of bread, and 200 c.c. of water. The stomach is washed out at the end of six hours; if it is found to be empty at this time, there can be no motor impairment of the stomach.

2. **Method of Boas.**—If the stomach be washed out at the end of two hours after an ordinary Ewald-Boas test-breakfast, under normal conditions the stomach should be found empty.

3. **Test-supper of Boas.**—This supper consists of cold meat with bread and butter and a large cup of tea. If, on washing out the stomach the following morning, food is still found to be present, a dilatation of the stomach exists.

4. The addition to the evening meal of a tablespoonful of currants, or raisins has been recommended in as much as such food residues can more readily be recognized in the wash water the following morning.

5. **The Starch Retention Test of Hausmann.**—A test supper of a small plateful of boiled rice is taken at night and the fasting stomach is aspirated the following morning. The contents are allowed to sediment and the supernatant fluid poured off and tincture of iodine added and mixed with the residue; water is now added until the mixture is transparent. If rice granules are present, they will appear as blue particles in the fluid. The test has been modified by some in that currants or raisins are added to the rice meal.

Dietetic Test for Determining at the Same Time Disturbances of both the Motor and the Secretory Functions of the Stomach.—**Method of Sahli.**—In this test substances not absorbed by the stomach are added to a test-meal. After withdrawal of the stomach-contents it is possible to determine how much of the test-meal has passed into the intestine, how much remains in the stomach, and how much of the withdrawn meal consists of gastric secretion. The Sahli test-meal consists of the following: 25 gm. of ordinary flour and 15 gm. of butter are placed in a suitable vessel over a flame and allowed to roast until brown. To this are slowly added 350 c.c. of water, and the whole stirred constantly; a pinch of salt, sufficient for seasoning, is added, and the mixture is allowed to boil for one or two minutes. After the stomach has been thoroughly washed out the patient is given 300 c.c. of this soup, and the remaining 50 c.c. are retained as a control. After one hour the stomach contents are withdrawn and the quantity is noted. Three hundred cubic centimeters of water are now introduced through the tube, and the stomach is gently massaged; within a few minutes this diluted meal is withdrawn and its quantity noted.[1]

[1] For the method of examining the contents see Sahli, Berlin. klin. Wochenschr., 1902, Nos. 16 and 17; and Aronson, Medical Record, Dec. 5, 1903.

Dietetic Test in the Diagnosis of Atypical Cases of Ulcer of the Stomach.—In cases of atypical forms of ulcer of the stomach Leube advises his dietetic treatment (see same) as an aid to diagnosis. If a beneficial result follows the treatment, the presence of an ulcer is indicated.

Dietetic tests are often of value as a means of diagnosis and prognosis in diabetes and nephritis. These tests are described in the section on Diabetes and Nephritis.

Schmidt and Strassburger Test-Diet.—Breakfast: 500 c.c. milk (or, if milk be badly borne, 500 c.c. of cocoa, made of 400 grams water, 20 grams cocoa, 10 grams sugar, and 100 grams milk); in addition, 50 grams of zwieback. Forenoon: Half liter oatmeal gruel, made of 40 grams oatmeal, 10 grams butter, 200 grams milk, 300 grams water, one egg and a little salt, the whole to be passed through a sieve. Mid-day: 125 grams hashed beef (weighed raw), broiled with 20 grams butter, as rare Hamburg steak; 250 grams puree of potato (made of 190 grams mashed potato, 100 grams of milk, 10 grams butter, and a little salt).

Afternoon: Same as breakfast. Evening: Same as forenoon. This diet yields 2132 calories and contains 97 grams of protein, 11 grams of fat, and 191 grams of carbohydrates. The beginning of this diet is marked by giving 0.3 gram of carmine in a konseal. In health this diet will go through the intestine in 15 to 25 hours. In diarrhea, where the principal trouble is in the colon, in 10 to 15 hours, and where there is increased peristalsis of the entire bowel, in 3 to 5 hours. To test the digestion of certain articles of diet twice the usual amount should be given, and charcoal may be used to mark the food so given. The amount of mucus, the appearance, the reaction, the amount of fermentation, may all be noted. This method of studying stools is simple, easily carried out, and of great practical value.

Schmidt's Test-Diet.—On arising in the morning: One-half liter of milk; tea or cocoa (if possible, with milk), together with one roll with butter, and one soft-boiled egg.

Breakfast.—One dish of oatmeal, cooked in milk and strained (salt or sugar permissible). Under certain conditions gruel or porridge may also be given.

At Noon.—One-fourth pound of finely-chopped lean beef boiled rare, with butter (the interior raw), and, with it, not too small a portion of potato broth (well strained).

In the Afternoon.—Same as in the morning, without the egg.

In the Evening.—One-half liter of milk or a plate of soup (as in the morning), together with a buttered roll and one or two eggs, soft boiled or scrambled.

The test diet is given at least for three days, until a stool is obtained coming with certainty from the diet. If connective tissue appears in the stool, it is an indication of a disturbance of gastric digestion.

If muscle appears in the stools, there must be some disturbance of the small intestine. If both muscle and connective tissue are present, a disturbance of both stomach and intestine is at hand.

Dietetic Test in Diabetes.—**Sugar Tolerance Test.**—In order to determine the sugar tolerance under normal conditions, as well as in mild forms of diabetes, dyspituitarism, hyperthyroidism, renal glycosuria, as well as in carcinoma, 100 grams of dextrose is given, and the blood sugar determined just before one-half hour, one hour, and two hours after the glucose meal. The procedure of Janney and Isaacson [1] is more accurate, in which the glucose dosage is apportioned to the patient's body weight (for each kilogram of body weight 1.75 gm. of glucose is given dissolved in 2.5 c.c. of water per gram of glucose). In normal individuals after the ingestion of the dextrose the blood sugar content rises from 0.09 or even less to a height not usually above 0.165 per cent. within forty-five minutes, falling usually more gradually within two hours to about the level as that observed in the fasting state. In patients with diminished carbohydrate tolerance, especially in diabetes, dyspituitarism, hyperthyroidism, renal glycosuria, and in cancer, notably of the gastro-intestinal tract, the hyperglycemia is more prolonged and pronounced, the blood sugar usually obtaining a height of 0.2 per cent. or higher, the reaction remaining for three to four hours. Inasmuch as the ingestion of the larger doses of glucose is objectionable on account of being nauseating and distasteful to the patient, it may be more dangerous in overtaxing a weakened tolerance, as one finds in diabetes.

Brill [2] has recently advised a simpler method in the form of a meal consisting of bread, butter, cereal, eggs, sugar, coffee, and cream, consisting of 100 gm. carbohydrates, 26 gm. protein, 27 gm. fat, 760 calories. It was observed that in normal individuals the blood sugar estimation remains nearly constant after the meal, while in those instances in which the blood sugar tolerance is lowered the maximal percentage occurs between one and two hours following the meal.

Tests for Hepatic Insufficiency.—It is a well-observed fact that a normal adult can ingest 50 grams of levulose without producing an increase in blood sugar. Spence and Brett determined that in disturbed liver function a definite rise in blood sugar occurs after the ingestion of the levulose, the height and duration of the sugar curve being proportionate to the degree of disturbance of liver function. Covell [3] has more recently studied this test. He administers 50 gm. of levulose to individuals weighing 168 pounds; 40 gm. to those weighing 126 pounds, and 35 gm. to those weighing 98 pounds. The blood sugar is determined before giving the levulose and one and two hours following its administration, when it remains high after two

[1] Jour. Amer. Med. Assoc., April 20, 1918.
[2] Jour. Lab. and Clin. Med., 8, 727, August, 1923.
[3] Guy's Hospital Reports, 73, 354, July, 1923.

hours a diagnosis of disturbance of the liver function is made and in proportion to the duration of the height of the curve.

Widal's Hemoclastic Crisis as a Test of Liver Function.—In a fasting stomach in the morning three determinations of the systolic blood-pressure are noted and leukocyte counts are made at intervals of twenty minutes. A glass of milk is then taken; at twenty minute intervals a second, third, and fourth observation is made. Normally no fall in blood-pressure is noted nor in leukocyte count. However, when the liver function is impaired, the blood-pressure will fall 10 to 20 degrees and the leukocytes will diminish in numbers from a quarter to a half.

Nephritic Tests.—See Diseases of the Kidney.

DIET FOR SINGERS AND SPEAKERS

The diet exerts considerable influence on the voice. A full meal may impair the respiration to such an extent as to interfere with singing or even to make it entirely impossible. The congestion of the vocal cords which may follow the taking of food or drink or smoking often has an injurious effect on the voice. Irritating articles of food and drink may also impair the voice, and should always be avoided by singers and speakers. Singers often possess curious idiosyncrasies, certain articles of food impairing the voice of some while improving that of others. W. C. Russell, in Representative Actors, gives an interesting list of articles taken by prominent actors before going on the stage. He states that Edmund Kean, Emery, and Reeve drank cold water and brandy; John Kemble took opium; Lewis, mulled wine and oysters; Macready was accustomed to eat the lean of a mutton chop previous to going on the stage, but subsequently lived almost exclusively on a vegetable diet; Oxbury drank tea; Henry Russell ate a boiled egg; W. Smith drank coffee; Braham drank bottled porter; Miss Catley took linseed tea and Madeira; G. F. Cook would drink anything; Henderson used gum arabic and sherry; Incledon drank Madeira; Mrs. Jordan ate calves'-foot jelly and sherry; C. Kean took beef-tea; Mrs. Wood sang on draught porter; Harley took nothing during a performance. Malibran, it is said, ate a lunch in his dressing-room half an hour before singing. This consisted of a cutlet and half a bottle of white wine, after which he smoked a cigarette until it was time to appear.

As a rule, nothing should be eaten before singing or speaking. The principal meal should be taken two or three hours before, and it should be somewhat lighter than usual. Many singers eat but little on the day of their performance, but partake of a good meal afterward. A food much used by singers is the so-called "Jenny Lind soup." This is very bland and does not alter the voice. It is made of bouillon and sage, to which are added, before serving, the yolks of two eggs beaten up in a half-pint of cream. A half-teaspoonful of

sugar is added, and it is flavored with spices. Others take raw eggs, egg and sherry, or albumin-water, while still others prefer jellies of the gelatin variety, or even honey. Orange-juice has its advocates, and the chewing of dried plums has been recommended. Mandl suggests that before the performance the singer should take a few bites of bread or chocolate and rinse the mouth with cold water. If the song is lengthy, cold water or sugar water may be taken during the performance.

In the interval between concerts the singer should live on a general mixed diet, avoiding irritating foods. Most singers have a tendency to become stout. The general rules for dieting the obese may be enforced to prevent or to remedy this.

Alcohol, in the form of the stronger beverages, is harmful to the voice and should always be avoided. Light wines and beer, except when taken to excess, are not generally injurious. They are best avoided, however, as their use may lead to the formation of the liquor habit.

Smoking is injurious to the voice. According to Mackenzie, however, many famous singers used tobacco freely without apparent harmful effects.

DIET DURING ATHLETIC TRAINING

The course of diet and exercise which athletes, both amateur and professional, undergo to fit them physically for games, contests, or feats of endurance, is known as athletic training. The necessity for such training is fully recognized by all athletes, and while opinions differ as to methods, there is perfect accord in the ideal that is sought.

Professional athletes who are constantly performing feats of strength, skill, or endurance, are, for the most part, more or less constantly in training, and recognize the importance of keeping in perfect trim. While occasional indulgences may not be harmful, continued dissipation is always disastrous in its consequences. This is especially true where finer skill and judgment are required and steady nerves are a necessity.

The ultimate object of all training is to reduce the body-weight until it will remain constant under the regular routine of life during the training period. There is usually a loss of weight for the first few weeks, varying with the previous condition of the individual. In about three weeks the weight becomes constant. The loss of weight is accomplished at the expense of the fat and water in the tissues. In well-trained men the muscles are hard and firm, the fat is reduced to a minimum, the skin is clear, the eyes are bright, the expression is indicative of perfect health, the body is active, svelt, and full of verve, and the "wind" is good. In the undertrained individual the tissues are not hardened and the "wind" is not so good. In the overtrained there is a curious condition, due to overexertion or

a badly chosen dietary, or both, and the individual loses weight and energy, and is in every way unfitted for the contest for which he was preparing.

The length of time required to train an individual varies greatly, but a college youth of the average athletic type can usually be put in good shape in six weeks. The transition from ordinary life to that of training should be gradual. This is true both of diet and of exercise.

The diet-tables of various trainers differ considerably. As a general rule it may be said that the diet should consist of wholesome food, such as good lean beef or mutton, best given underdone, toast or stale bread, and potatoes and green vegetables of all kinds. Among the proscribed articles are all entrées, puddings, pastries, sauces, pickles, spices, "appetizers," and all fancy and complex dishes. Twice-cooked meat should be avoided. All spirits and strong alcoholic drinks, as well as tea, coffee, and nerve stimulants of any kind, should be prohibited. Some trainers allow a moderate amount of light wine or beer, while others forbid their use entirely. On the whole, it would seem best to omit them. Tobacco in all forms is forbidden.

Water is usually allowed in considerable quantity—generally as much as is desired—early in the training. If there is a tendency to obesity, the amount is somewhat limited. The quantity is reduced gradually, only sufficient being allowed to allay thirst; it should be sipped slowly. The importance of limiting the amount of water ingested for a few days before any contest is recognized by all professional athletes and trainers.

Food is best given in three meals, at about equal intervals of time: Breakfast between 8 and 9; dinner between 1 and 2; and supper between 7 and 8 or 8 and 9.

The relation of sugar to training is of special interest, and opinions concerning its use differ. Men in training seem to crave sugar, and are often allowed a reasonable amount on cereals, or in tea and coffee *when the latter are used,* but it is generally deemed advisable to forbid its use in pastries and cakes. Further study is needed to decide this question. In this connection it is interesting to consider the report concerning the addition of sugar to the diet of two club crews in Holland during the training for a race. Atwater and Bryant[1] cite the following case:

"Two young men with only two hours a day for practice, at the end of two months entered for the race. No change had been made from their usual diet except that they ate as much sugar as they wished, sometimes as much as a third of a pound, at the time of their daily exercise. One of them, however, did not make this addition to his diet until the third week, when he began to show all the signs of overtraining—loss of weight and a heavy, dull feeling, with

[1]Dietary Studies of University Boat Crews.

no desire to study. On the third day after beginning the use of sugar these symptoms disappeared. At the time of the race both youths were victorious over their antagonists, who did not believe in the use of sugar. No bad effects were observed.''

The accompanying interesting table (p. 254) is taken from the report [1] mentioned.

Thompson [2] gives the following report of the Yale crew, on the authority of Dr. Hartwell, formerly a captain of the University crew and of the University foot-ball team:

''The training covered a period of ten and one-half weeks. Breakfast, at 7.30 A. M., consisted of fruits (oranges, tamarinds, figs, and grapes); cereals with rich milk and sugar, etc.; beefsteak, usually rare; chops, stews, hash, with once or twice a week some salt meat, as bacon or ham, usually accompanied by liver; stewed, browned, or baked potatoes; eggs served in different ways; oatmeal-water and milk as beverage, with tea on special occasions for some particular individual. Dinner consisted of soups, meats, fish, vegetables, with a simple dessert, such as rice, bread, or tapioca pudding, some fruit, and the same beverages as at breakfast were also used. The meats included roast beef, mutton, or chicken, two kinds being always served. But little gravy was used. Fish was served twice a week. The vegetables included potatoes, mashed or boiled; tomatoes, peas, beans, and corn. Two vegetables besides potatoes were usually served. Supper (8 to 8.15 P. M.) consisted of cereals, as at breakfast; chops, stews, or cold meat from dinner; rarely beefsteak; potatoes, stewed or baked; and eggs about three times a week, usually not on the same days that they were served for breakfast. Sometimes ale was permitted to some individual. After the crews were in final preparation for the race at New London the diet varied somewhat. Breakfast and dinner remained about the same, but a light luncheon of cold meat, stewed or baked potatoes, milk and toast was served at 4.30 in the afternoon. After this the evening exercise was engaged in for about two hours. Forty-five minutes after this was completed cold oatmeal or other cereal with milk and toast was served. A light supper (9.30) was served just before the men retired. This diet was much more liberal than that served ten years before. The men were allowed as much food as they desired.''

Atwater and Bryant [3] give the following account of the diet of the Harvard boat crew at Cambridge, in 1898, in the description of the conditions of their dietary studies. The diet was simple, and consisted of roast and broiled beef and lamb, fricasseed chicken, roast turkey, and broiled fish. Eggs, raw, poached, or boiled in the shell, were used plentifully. Large amounts of milk and cream were also

[1] Bulletin No. 75, United States Department of Agriculture, Experiment Station.
[2] Practical Dietetics, p. 726.
[3] Loc. cit.

consumed. Oatmeal, hominy, and shredded wheat were eaten extensively, and corn cakes were served occasionally. Bread was almost always taken in the form of dry toast. Potatoes were served twice a day, either baked or boiled and mashed with the addition of a little milk and butter; occasionally they were "creamed." Boiled rice, prepared with a little cream and sugar, was served instead of potatoes at some meals. Beets, parsnips, green peas, and tomatoes were used to furnish a variety of vegetables. Macaroni was occasionally

Summary of Results of Dietary Studies of University Boat Crews and Other Dietary Studies.

(Nutrients in food actually eaten per man per day.)

	Protein.	Fat.	Carbo-hydrates.	Fuel-value.
DIETARY STUDIES OF UNIVERSITY BOAT CREWS.	*Gm.*	*Gm.*	*Gm.*	*Calories.*
Harvard University crew at Cambridge (No. 227)	162	175	449	4130
Harvard Freshman crew at Cambridge (No. 228)	153	223	468	4620
Yale University crew at New Haven (No. 229) .	145	170	375	3705
Harvard University crew at Gales Ferry (No. 230)	160	170	448	4075
Harvard Freshman crew at Gales Ferry (No. 231)	135	152	416	3675
Yale University crew at Gales Ferry (No. 232) .	171	171	434	4070
Captain of Harvard Freshman crew (No. 233) .	155	181	487	4315
Average	155	177	440	4085
SUMMARIZED RESULTS OF OTHER DIETARY STUDIES.				
Football team, college students, Connecticut[1] . .	181	292	557	5740
Football team, college students, California[2] . . .	270	416	710	7885
Professional athlete, Sandow[3]	244	151	502	4460
Prize-fighter, England[4]	278	78	83	2205
Average of 15 college clubs[5]	107	148	459	3690
Average of 14 mechanics' families[5]	103	150	402	3465
Average of 10 farmers' families[5]	97	130	467	3515
Average of 24 mechanics' and farmers' families[5]	100	141	429	3480
Average of 14 professional men's families . . .	104	125	423	3325
DIETARY STANDARDS.[6]				
Man with moderate muscular work (Voit) . . .	118	56	500	3055
Man with moderate muscular work (Playfair) . .	119	51	531	3140
Man with moderate muscular work (Atwater) . .	125	. .	. .	3500
Man with hard muscular work (Voit)	145	100	450	3370
Man with hard muscular work (Playfair) . . .	156	71	568	3630
Man with hard muscular work (Atwater) . . .	150	. .	. .	4500
Man with severe muscular work (Playfair) . . .	185	71	568	3750
Man with severe muscular work (Atwater) . . .	175	. .	. .	5700

1 Connecticut (Storrs) Sta. Rpt., 1891, p. 128.
2 Unpublished material.
3 Connecticut (Storrs) Sta. Rpt., 1896, p. 158.
4 Medical Times and Gazette, 1865, vol. i., p. 459.
5 United States Department of Agriculture Yearbook, 1898, p. 450. The results are summarized from Connecticut (Storrs) Sta. Rpts., 1891 to 1897, and the bulletins of the United States Department of Agriculture.
6 From a summary in United States Department of Agriculture, Office of Experiment Stations, Bulletin No. 21, pp. 206–213.

served. For dessert, apple, tapioca, custard, or other pudding containing a large proportion of milk and eggs, was served. The members of the crew were allowed beer once a day. Milk was obtained from one of the large creameries supplying that vicinity, and was of unusually good quality, containing 5.8 per cent. of butter-fat. A very thick, heavy cream was also used, diluted about one-half with milk. This mixture, or thin cream, contained about 16 per cent. of butter-fat.

The beef used during the studies was entirely from the loin. The roasts were sometimes from the fillet, and at other times the ordinary loin roast with the bone was used. The meat was sliced, freed from practically all the clear fat, and sent to the table in a large platter, from which the men were served individually. The beef was served rare, but not too underdone; some of the other club tables in the same house served much rarer meat. The beefsteak was freed from bone and from nearly all the visible fat before being served.

Lamb chops were served with the bone. Lamb and mutton roasts, which were all taken from the leg, were also clear meat, trimmed so as to be practically free from visible fat. The turkey used was

Position.	Age.	May 23.		May 24.		May 25.		May 26.	
		Before rowing.	After rowing.	Before rowing.	After rowing.	Before rowing,	After rowing.	Before rowing.	After rowing.
	Yrs.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
2	20	155	. .	158	154¼	156⅓	154¾	155¾	154½
3	21	163	. .	162½	160½	162½	161½	163½	161½
4	20	165	. .	166	163¾	165	163	164¼	162¾
5	19	160½	. .	161	158½	161	159½	161¼	159¾
6	22	173½	. .	174	172	174	172	173½	170
7	19	161½	. .	160	157	159	156½	160½	157½
Stroke	26	147	. .	147½	145½	148	145½	149	146½
Substitute . .	. .	171	. .	171	168	171	168½	170	168
Average . . .	. .	162	. .	162½	160	162⅛	160⅛	162¼	160
Average loss .	. .	. .	. .	. .	2½	. .	2	. .	2¼

Remarks.—On May 23 weight not taken after rowing. May 24, medium work. May 25, hard work—eight minutes of very hard work. May 26, light work.

shipped from a distance, and had been kept in cold storage. It was baked with force-meat,—*i. e.*, "stuffing" or "dressing,"—although but little of this latter was served to the crew. Chicken was always fricasseed, and served free from all bones, with the exception of those of the leg and wing.

Broiled fish, usually bluefish or Spanish mackerel, was commonly served for breakfast, as were also eggs, either raw or poached. No pastry was allowed, and the puddings were, as previously stated, composed largely of eggs and milk. A small amount of coffee jelly was served, and at one meal during the study ice-cream was allowed. No fresh fruit, with the exception of oranges for breakfast, was served. Stewed prunes, rhubarb, or apples were also eaten, prunes

most abundantly. No beverages other than water, milk, and beer were allowed. Breakfast was served at 8, lunch at 1, and dinner at 6 o'clock, although one or the other of the crews was usually late at dinner. Atwater and Bryant [1] give the following statistics of the Harvard crew at Cambridge, 1898; the positions shown in the table (p. 255) are those occupied by the different men at the time of the race.

"The loss of weight during the period of exercise is due principally to water of perspiration and the water and carbon dioxid excreted in the breath."

It is interesting, in this connection, to compare the diet of the English boat crews, as given by Yeo.[2] Maclaren gives the following schemes of training as carried out at Oxford and Cambridge:

A DAY'S TRAINING FOR THE SUMMER RACES.

Oxford	Cambridge.
7 A. M.: Rise. A short walk or run.	A run of 200 yards as fast as possible.
8.30 A. M.: Breakfast of underdone meat, crust of bread or dry toast, tea (as little as possible).	Underdone meat, dry toast, tea 2 cups (later only 1½), water-cress (occasionally).
2 P. M.: Dinner: meat (as at breakfast), bread, no vegetables (not strictly adhered to), 1 pint of beer.	Meat (as at breakfast), bread, potatoes, and greens, 1 pint of beer. Dessert: oranges, biscuit, or figs, 2 glasses of wine.
5 or 5.30 P. M.: Rowing exercise.	Rowing exercise.
8.30 or 9 P. M.: Supper: cold meat or bread, sometimes jelly or watercress, 1 pint of beer.	Cold meat, bread, lettuce or watercress, 1 pint of beer.
10 P. M.: Retire to bed.	

A DAY'S TRAINING FOR THE WINTER RACE.

Oxford	Cambridge.
7.30 A. M.: Rise. A short walk or run.	7 A. M.: Exercise as for summer races.
9 A. M.: Breakfast, as in summer.	8.30 A. M.: Breakfast as in summer.
1 P. M.: Luncheon: bread or a sandwich and ½ pint of beer.	A little cold meat, bread, and ½ pint of beer, or biscuit and glass of sherry (sometimes yolk of egg in the sherry).
2 P. M.: Rowing exercise.	Rowing exercise.
5 P. M.: Dinner: meat as in summer, bread, same rule as in summer as to vegetables, rice pudding or jelly, and ½ pint of beer.	5 to 6 P. M.: Dinner, as in summer.
10 P. M.: Retire to bed.	
Water strictly forbidden. As little liquid to be drunk as possible.	

In summing up the results of their observations Atwater and Bryant state that, in a "general way, the difference between the food of the athletes and that of other people represents a difference in actual physical need even if neither is an accurate measure of that need." One of the chief differences lies in the fact that the food of athletes is productive of a larger amount of energy than that con-

[1] Loc. cit.

[2] Food in Health and Disease, p. 281.

sumed by ordinary working-people or college men. The daily excess over the ordinary diet was about 400 calories, or about 10 per cent. The amount of protein consumed was 45 per cent. larger. "In other words, the difference in protein was four and one-half times as great as the difference in fuel-value, and the excess in protein would account for a considerable part of the excess of energy of the diet of the athletes as compared with men in ordinary occupation."

Atwater and Bryant[1] close the account of their experiments with the following interesting observations:

"In this connection it is interesting to observe that many physiologists are coming to entertain the view that the amount of metabolism in the body is regulated not simply by the muscular work, but also by the nervous effort required in the performance of this work. The especially large proportion of protein observed in the dietary studies of the university boat crews, of foot-ball teams, of the professional athlete, and of the pugilist, as compared with the dietary studies of college men with ordinary exercise, and with ordinary families of workingmen and professional men, accord well with a view not uncommon of late among physiologists. According to this view, men who perform continued muscular labor, even if it is active enough to make the total amount large, do not require especially large amounts of protein in their food so long as they undergo no especial mental strain or muscular fatigue, the principal requirements being an abundant supply of easily digested food-material. On the contrary, when a man or animal must perform intense muscular work for a short period of time, and is, therefore, under more or less nervous as well as muscular strain, a considerably larger supply of protein seems to be required than under normal conditions of slow, long-continued work. In other words, if a large amount of work must be done in a short time a considerable excess of protein is required in the food. This view, which has been especially advocated by Zuntz,[2] seems to be favored by the results of dietary studies above discussed.

"Recent experiments made by Dunlop, Paton, Stockman, and Maccadam[3] have to do with the amount of protein required when severe muscular work is performed. The results are discussed with especial reference to training, and are believed to "show the importance of two points long known to athletes and others doing excessive muscular work. The one is the importance of proper training, for by it an abstraction of protein matter from tissues other than muscle can be avoided; the other is the importance of there being a sufficiency of protein in the diet to compensate for the loss which occurs. An abundance of protein in the diet of an athlete has other functions to

[1] Loc. cit.

[2] United States Department of Agriculture, Experiment Station Record, vol. vii., pp. 538-550.

[3] Jour. Physiol., 1897, vol. xxii., p. 69.

fulfil besides this. It is required during training for building up the energy-liberating mechanism—the protoplasm of muscle; and it is also required after work to repair that mechanism. The benefits of training are well known in other ways, such as preparing the heart for suddenly increased duty and limiting the after fatigue effects.

"The power of the body to perform the maximum of muscular work within a comparatively short time and with a minimum amount of fatigue is secured by means of training. Of course, skill in application of muscular strength is as essential as is the amount of power exerted. The skill is sought by exercise and practice. The object of regulating the diet in training is not only to furnish the material to supply the power, but also to put the machine in the best condition for developing as well as applying the power. In other words, the man is to be subjected for a short time to intense muscular strain and considerable nervous effort. This he is to bear with a maximum of result and the minimum of fatigue. For this he needs practical training, on the one hand, and proper diet, on the other. If the views above presented are correct, the diet for men from whom intense muscular effort is required for short periods should supply liberal amounts of energy and especially large amounts of protein."

INFANT FEEDING

THE subject of infant feeding, during both health and disease, is one of extreme importance, and one on which success in pediatric practice largely depends. Before taking up the study of infant feeding the student should read carefully the section on Milk.

Infancy is that period of life dating from birth to about two and one-half years. Childhood is the period from two and one-half years to puberty. The theory that infancy ends at two and one-half years is an arbitrary one.

There are four methods of feeding infants: 1. Breast- or maternal feeding. 2. Wet-nursing. 3. Mixed feeding—*i. e.,* breast-feeding supplemented by bottle-feeding. 4. Bottle- or artificial feeding.

Breast Feeding.—The milk from a healthy mother is by far the best nourishment for an infant during the first year of its life, and cannot be fully replaced by any other form of feeding. Infants fed on the breast milk of a healthy woman are stronger and better able to resist disease. They are more apt to live through the first year of life, are almost free from the scourge of the severe infant diarrheas. This is particularly true of the poorer classes who often lack both the time and the intelligence required to rear a healthy baby by bottle feeding. While it is undoubtedly true that babies may be reared on artificial foods and remain healthy and grow strong, the percentage of robust bottle fed babies is much smaller than that of healthy breast fed infants.

Contraindications to Maternal Nursing.—The mother should not nurse the child if she has tuberculosis in any form, as she not only exposes the child to infection, but hastens the progress of the disease in herself. If she has pulmonary tuberculosis, nursing the child will almost certainly prove fatal to her.

When the mother has had any severe complication late in pregnancy or in connection with parturition she should not suckle her child. Examples are nephritis, convulsions, severe hemorrhage or septic infection.

Nursing is contraindicated if the mother is choreic or epileptic.

When no milk is secreted nursing is, of course, impossible. When the mother has shown on two previous occasions under favorable conditions that she is unable to nourish her child a third attempt may be made, but the child should be very closely watched and not allowed to suffer from underfeeding in case no milk is secreted.

Education of the Mother.—Physicians, nurses and the various agencies for health education have done much and can do more to impress upon the mother, particularly during the latter months of pregnancy, that maternal feeding is the normal, natural, safe, and

easy way to nourish the baby. If there is any tendency to evade the responsibility the question should be carefully explained, calling attention to the higher death rate, the fact that most of the babies who die during the first year of life of diarrheal diseases are bottle fed. Many a child is weaned for trivial reasons because the importance of breast feeding is under-estimated and many are weaned because of a lack of knowledge as how to best meet some of the surmountable difficulties sometimes encountered. The following points will be found helpful:

The Care of the Nipples.—Before the child is born the breasts should be inspected and if the nipples are short and retracted they should be lengthened by making gentle traction on them by pulling the nipple out with the fingers several times a day. The results are usually satisfactory. A breast pump may be used or a baby employed to suck on the nipples to elongate them. Occasionally the nipples are too large and a breast shield of proper size has to be used until the child grows sufficiently large to take the nipple satisfactorily.

The nipples should be washed off with sterile water or boric acid solution and dried before and after every nursing. If the nipples show any tendency to become dry and crack between nursings a very mild boric acid ointment or plain vaseline may be used to keep them soft.

Tender nipples are best treated by applying half alcohol and half water.

Cracked or fissured nipples are best treated by having the child nurse through a nipple shield. The fissure may be painted with the compound tincture of benzoin or, if necessary, touched with one or two per cent. solution of nitrate of silver.

Tender and inflamed breasts are best treated by supporting the breast and the application of cold. The breast should be kept empty by means of a breast pump, or by having the child nurse it. If there is any pus in the milk the child should not nurse.

The Nursing Mother.—The regulation of her life is of the utmost importance. The essentials are plenty of rest, at least eight hours in bed at night, and an hour's nap in the day-time; a daily bath, a daily walk in the open air, and as much out-of-door life as is consistent with her mode of life. Over-work and extreme fatigue should be avoided, as should worry. Some pleasant recreation should form part of each day if it is possible. Extreme emotions, anger, grief, and the like are bad for the milk, while contentment and an atmosphere of happiness favor lactation. Constipation should be avoided by dietary measures and as few drugs taken as possible.

The diet should be of plain nutritious foods. There is no need to make unnecessary restrictions. We instruct the mothers to eat plenty of plain meats, eggs, vegetables, cereals, bread and butter, fruits and simple desserts. To drink milk, a quart a day if it can be done without disturbing digestion, and six or eight glasses of water. Part

of the milk can be taken in cocoa. Tea or coffee in moderation, preferably once a day. Avoid any food which she knows gives her indigestion and rich and complicated dishes. Moderate amounts of salad may be allowed but only if they agree and with very simple and not too acid dressings. Spices, mustard, and highly spiced foods occasionally cause colic in the baby and sometimes this follows the ingestion of fruits containing aromatic substances; in which case they are to be avoided.

Sufficient calcium should be supplied and cheese, milk, the legumes, oatmeal and almonds are all rich in calcium. (See also Metabolism and Oxaluria.)

Galactogogues.—There are no galactogogues known of positive value, but we prescribe the thick malt extracts, a tablespoonful three times a day taken in cold water or on bread and butter in cases where the milk is poor or deficient in quantity. Where the fat is deficient plenty of butter, cream and olive oil may be added to the diet. If the mother is under-nourished these means are of great service. If the mother is well nourished they tend to form fat and should be used with caution or not more than would be in the ordinary diet.

Hoobler has found that diets containing milk proteins and animal proteins are better for producing milk than those containing vegetable proteins, with the exception that nut protein seemed as efficient as meat proteins in this regard. The best results were obtained on a nutritive ration of 1 : 6, that is, the ratio between the digestible proteins to the digestible carbohydrates and fats and that the diets between 2600 and 2900 calories per day produced better results than those containing 3400 or 3700 a day while those under 2000 were inadequate. The overfeeding did not increase the milk. Cows' milk protein was found to be the best form to increase the milk production and protect the mother's tissues.

Human Milk.—This subject is also considered in the article on Artificial Feeding under the heading of The Composition of Milk. Holt, Courtney, and Fales[1] divide lactation into four periods, as shown in the following table:

Percentage Composition of Women's Milk by Periods

Period.	No. of analyses.	Fat.	Sugar.	Protein.	Casein.	Albumin.	Ash.	Total solids.
Colostrum (1-12 days)	5	2.83	7.59	2.25	...	...	.3077	13.42
Transition (12-30 days)	6	4.37	7.74	1.56	...	...	.2407	13.39
Mature (1-9 months).....	17	3.26	7.50	1.15	.43	.72	.2062	12.16
Late (10-20 months)	10	3.16	7.47	1.07	.32	.75	.1978	12.18

[1] Amer. Jour. Dis. of Children, October, 1915, x, 229.

They also made special studies of the salt content, which they found as follows:

Averages for the Different Periods

	No. of analyses.	Total ash.	CaO.	MgO.	P_2O_5.	Na_2O.	K_2O.	Cl.
Colostrum (1-12 days)	5	.3077	.0446	.0101	.0410	.0453	.0938	.0568
Transition (12-30 days)	6	.2407	.0409	.0057	.0404	.0255	.0709	.0580
Early mature (1-4 months) ...	9	.2056	.0486	.0082	.0342	.0154	.0539	.0351
Middle mature (4-9 months) ...	8	.2069	.0458	.0074	.0345	.0132	.0609	.0358
Late milk (10-20 months) .	10	.1978	.0390	.0070	.0304	.0195	.0575	.0442

Average Percentage Composition of Ash for the Different Periods

	CaO.	MgO.	P_2O_5.	Na_2O.	K_2O.	Cl.
Colostrum	14.2	3.5	12.5	13.7	28.1	20.6
Transition	17.0	2.4	16.9	10.9	30.8	22.9
Mature	23.3	3.7	16.6	7.2	28.3	16.5
Late	19.8	3.6	15.5	10.1	28.8	22.3

It will be noted that in the colostrum period there is high protein and ash and rather low fat; in the transition period protein and salts are lower and the fat higher, after one month there is no essential change until the end of lactation, when there is a fall in everything except the sugar. The sugar is the most constant, and Holt, Courtney and Fales give the average as 7.25 per cent. in place of the usual 7 per cent. The protein in mature milk is seldom over 1.25 per cent. The greatest variations are in the fats. The high ash of the colostrum period is largely due to the Na_2O and K_2O. The variations are seen in the Na_2O, while the CaO is nearly constant throughout lactation. The K_2O is the largest constituent, and this, with the CaO, makes up more than half the total ash. Cow's milk contains about three and one-half times as much total ash as human milk, but the proportion is nearly the same; the cow's milk has more P_2O_5 and less iron.

Reestablishment of Lactation.—Where nursing has been abandoned it may be advisable to attempt to reestablish the flow of milk and this may also be done when nursing has *not* been attempted at all. The child should be put to the breast at regular intervals and allowed to nurse, which it will do under protest, as there is no milk. The child should then be fed on the proper substitute feeding and the breast thoroughly emptied by milking. The breast is milked from about one inch behind the areola forward to the nipple, and the

breast pulled downward and forward. The trick of manual expression of the milk is easily learned. The breast back of the larger milk ducts need not be touched in this procedure. The regular nursings and milkings should be persisted in and as the milk flow begins to be established the child may be weighed and the difference between the needed food and the amount derived from the mother made up by artificial feeding. Varying lengths of time may be needed to re-establish the milk flow and it may be a couple of months before the complete supply is obtained.

Conditions Affecting Woman's Milk.—*Menstruation.*—In most instances the milk remains unaffected. In something under ten per cent. there may be some intestinal indigestion and in about one-third of these there may be some gastric disturbance with occasional vomiting. In some cases there is nervousness and irritability without any distinct gastro-intestinal disturbance. Menstruation is no contra-indication for nursing.

Pregnancy.—If the mother becomes pregnant the child should be weaned. The milk becomes poor and if toxemia is present it may contain substances which may poison the child.

Antitoxin.—Diphtheria and other antitoxins are eliminated in the milk. There are probably antitoxic or similar substances normally in the milk which may explain the well-known immunity of nursing infants to most infectious diseases. Very little is known about this subject at the present time.

Bacteria.—A few bacteria are usually found in the milk, but may be disregarded. In advanced tuberculosis or in tuberculosis of the mammary gland tubercle bacilli may be present. In septic conditions and in breast infections the invading organism may be found in the milk.

Alcohol.—Unless taken in very large quantities alcohol is not excreted in the milk. Beer or other malt liquors are often used to increase the quantity of milk. The fat in the milk is usually increased as well, but in some cases no effect is noted or the mother gains in weight.

Drugs.—Belladonna and its derivatives administered to the mother are excreted in the milk. Salvarsan is excreted in the milk and affects the infant usually favorably, but death of the infant has been supposed to be due to the administration of the drug to the mother. This needs further study.

Apart from salines and perhaps some of the other laxatives which may sometimes affect the child, few other drugs are excreted at all except in traces which are of no importance. After long continued use mercury, arsenic, bromides, salicylates, hexamethylenamin and the iodides may appear sometimes in sufficient quantities to affect the child.

Nervous Impressions.—Any severe emotion, as fright, anger or grief,

may affect the quantity of the milk, or it may be changed in some way so that the child may become ill.

Ferments and Other Substances.—Various ferments have been described in the milk, but these, vitamins, fat soluble A, water soluble B, poisons and proteins which produce hypersensibility in the infant are not thoroughly understood at this time.

Care of the Breasts.—If, for any reason, the child is weaned while the milk supply is still ample the best method of treating the breasts is to have them slightly supported by a bandage underneath and then let them absolutely alone. The breasts will fill full of milk, become very hard and slightly tender, then the milk secretion will stop and the breasts gradually return to normal. If the breast is not interfered with it will take care of itself very much better than if various manipulations are used. In cases of localized painful swellings, a breast pump may be used to remove the milk or another baby substituted if that is possible. Applications of cold afford greater relief from the pain than anything else.

The Intervals for Feeding.—On this point there are many and diverse opinions. The interval must be suited to the individual baby. At present it is the custom to feed the average infant every four hours. The first day the baby should be put to the breast every six hours, and on the second day the four-hour period instituted. Many babies on the four-hour schedule will not take enough in twenty-four hours to make satisfactory gains. These should be fed at shorter intervals. Small babies require shorter intervals—every three or even every two hours. If the milk flow is not established promptly the frequent emptying of the breasts is important, and a short interval schedule should be used. If the baby cries from hunger regularly before the feeding time, it may be fed at shorter intervals until it is large enough to take sufficient food. The milk should be examined and the baby weighed before and after nursing to determine the amount taken. If necessary, supplementary feedings may be given.

Testing the Milk.—Mother's milk may easily be tested by means of Holt's milk set, which consists of a lactometer and a cream gauge. (This may be had from Eimer & Amend, New York.) With this the specific gravity and the amount of cream may easily be estimated. Estimated with this instrument the cream is to the fat as 5 is to 3.

In taking a specimen of milk the child should be allowed to nurse a little and about the middle of the nursing chosen. The first milk drawn is much weaker in fat and richer in protein than the average, while the last is richer in fat and weaker in protein.

Modifying Mother's Milk.—There are several different types of milk met with and the following suggestions will be found of use:

1.—If the mother's milk is too rich it may usually be modified by limiting the diet, especially the amount of meat taken and prohibiting all alcoholic and malted drinks. The mother should be out

of doors as much as possible and exercise, preferably walking to the point of fatigue, is to be advised. These measures nearly always bring about the lowering of fats and proteins. In cases of infants with feeble digestive powers, one or two ounces of water may be given just before nursing. In some severe cases the child must be partially fed on other food for a limited period.

2.—When the milk is of good quality, but deficient in quantity, the amount may generally, but not always, be increased by the following measures: The mother should have nine or ten hours' rest in bed at night and a nap of an hour or so during the day. She should be out of doors as much as possible and as far as it can be done she

	Specific gravity, 70° F.	Cream, twenty-four hours.	Proteins.
Normal average	1.031	7 per cent.	1.5 per cent.
Healthy variations	1.028–1.029	9–12 per cent.	Normal (rich milk).
Healthy variations	1.032–1.033	5–6 per cent.	Normal (fair milk).
Unhealthy variations	Below 1.028	High (above 10 per cent.)	Normal or slightly below.
Variations	Below 1.028	Normal (5–10 per cent.).	Low.
Variations	Below 1.028	Low (below 5 per cent.).	Very low (very poor milk).
Variations	Above 1.033	High.	Very high (very rich milk).
Variations	Above 1.033	Normal.	High.
Variations	Above 1.033	Low.	Normal or nearly so.

should be relieved of her household cares and duties. Every day, if she is able, she should take a short walk out of doors. The diet should be ample with meat, eggs, cereals, vegetables, and simple desserts. The amount of fluid ingested is important and above what she would ordinarily take she should be given something over the amount that would be secreted in the milk, from one quart, one and one half quarts, or even two quarts. This may be given as milk, cocoa, very weak tea (but not too much of this), or plain water. In women of suitable nationality and disposition malted liquors, such as beer, porter or stout may be used, but always bearing in mind that possibility of starting the alcohol habit. The breasts should be massaged twice daily for five or ten minutes. Malt extracts, the thick ones, may also be given, a tablespoonful in cold water three times a day at meal times. Iron will be needed in anemic women. Olive oil and cream may often be used to advantage. In some women the extra food causes an increase in weight rather than in the milk. While waiting to see if the milk will be improved the child should not be forgotten, but should receive supplementary feedings.

3.—When the milk is poor in quality regardless of the quantity very little can be done and we no longer waste time in this class, but wean at once.

4.—There are some cases in which the milk appears to be normal

and yet for some undiscoverable reason the child does not thrive. There is no gain in weight and the child is anemic, fretful, sleepless, and often vomits and has abnormal stools. These cases should be weaned after a fair trial has been made to improve the condition. If the child is gaining a little, often much may be accomplished by supplementary feedings.

One Bottle a Day.—A moot point is whether it is wise to allow the child one bottle a day as a routine practice. The authors always follow this plan after the second month should it be deemed advisable in the case in hand, and where proper precautions regarding cleanliness and pasteurization have been taken, no ill results have been seen to follow. The advantages of this method are as follows:

The child learns to take milk from a bottle, and if, owing to the illness of the mother, it becomes necessary at any time to substitute the bottle, this may be done without much difficulty. On the other hand, if the child has taken nothing but the breast, it may often refuse the bottle entirely, with disastrous results, severe cases of inanition having been known to follow. This method facilitates weaning. If the mother is weak, it allows her to obtain an undisturbed night's rest. Among the upper classes the child is often weaned early so that nursing may not interfere with the mother's social pleasures and duties. If the breast-feeding be supplemented by the bottle, many of these women may be induced to nurse their children during the greater part of the first year, when they would otherwise give it up very early and abandon the child to the care of a nurse.

The First Few Days.—The first few days of the baby's life are very important ones and many of the subsequent troubles may be directly traced to an inadequate supervision of the child during this period. This happens not only among the ignorant and ill-informed, but also in the most intelligent classes and, curiously enough, all too frequently in otherwise more or less satisfactory lying-in hospitals.

During the first forty-eight hours the child receives practically no nourishment from the breast, the only fluid secreted during this time being colostrum. This has a laxative effect upon the infant's bowels, emptying them of the dark brownish material, known as meconium, that has accumulated in the intestinal canal during uterine life. The child should, however, be put to the breast at regular intervals, so as to establish a free flow of milk; this generally begins on the third day, but may be delayed. During the first two days after birth the child gets about six ounces of colostrum a day, which is all that is needed in the way of food. It may, however, be given a teaspoonful or two of warm boiled water or of a 5 per cent. solution of sugar of milk. Catnip, fennel tea and the like should not be given. In unusually robust but fretful children, or when there is fever a small amount of food may be required, and this may be given

according to the rules for artificial feeding. If the child is very small or premature follow the rules for feeding premature infants.

The importance of emptying the breasts at regular intervals cannot be too strongly insisted upon. This is the greatest stimulation to milk secretion that there is, not only during the first few days but during the whole of lactation. The breast is automatic and supplies the demands made upon it. If no milk is taken out none comes in. If the child is too feeble to nurse vigorously and for this reason more in need of maternal nursing than ever the colostrum may not be removed from the breasts and the secretion of the milk seriously interfered with. In such cases a healthy infant may be used to empty the breasts or a breast pump may be employed or the milk expressed by hand. The breasts should be nursed alternately in order that each one shall be properly emptied. All through lactation if the breasts are not emptied there is a tendency for the milk to become poor in quality. Many mothers who have little milk attempt to save it, which is a great mistake, for like the widow's cruse the more that is taken out the more comes in.

The milk secretion usually begins after the first forty-eight hours and from this time the normal infant begins to gain in weight. This is a most critical period, for all too often after a few trials at nursing and no milk coming in the breast the child is weaned when with a little patience the milk supply could be established. Usually when the milk comes in the breast there is ample evidence of it. It flows easily from the nipple, the breast fills up and the difference before and after nursing is very apparent. In some cases it may be difficult to tell whether the milk is coming in or not and in case of doubt the child may be weighed immediately before and after nursing. The child should be put to the breast at regular intervals for at least a week in cases in which the milk flow is delayed or scanty. If no milk is secreted by that time the child can be weaned and also if the milk is very scanty and very poor in quality. This should not be done, however, until a thorough trial has been made during which the breast is completely emptied.

During this Time the Child should not be Neglected.—It needs food after the first forty-eight hours and after nursing if it receives little or nothing the feeding should be supplemented with the proper amount in a bottle. The amount may be regulated according to the general rules for infant feeding. If the child vomits immediately after feeding it is generally due to too much being given; and the amount can be reduced. Another plan is to weigh the baby before and after feeding and the difference between the normal feeding and the amount taken from the breast given. The weighing should not be done in the presence of the mother, as it is apt to make her nervous.

The food supplied should be according to the general rules for

infant feeding, but if breast milk can be secured we prefer it to all other food. As so many children are born in lying-in hospitals these days this can often be secured without difficulty.

In all doubtful cases the child should be weighed daily until it is gaining and the feeding definitely established. After this twice a week for a few weeks, and then once a week is sufficient. In weighing the child it should be done with accurate scales, the child should be stripped, and it should be weighed at the same time every day and under the same conditions as regards the time of nursing, the emptying of the bladder and bowels. A change of several ounces can be seen by weighing a child with an empty stomach, empty bladder and bowels one day and with the reverse conditions the next.

If the child is not getting sufficient food it does not gain or even loses weight. It is fretful, worried and cross. If the child is getting too little milk of a good quality it is fretful and gains slowly or not at all, but there is rarely any disturbance of stomach or bowels unless the quantity is much too little. If the milk is very deficient in quality or both or for some reason unsuited for the child there are alimentary disturbances, usually a diarrhea with greenish stools containing a large amount of mucus and often undigested curds. Sometimes the stools are brownish with small curds the size of a grain of wheat or larger. Rarely there is constipation with small hard dry stools often associated with colic. There may also be vomiting of small amounts of milk mixed with mucus and colic due to gas in the stomach or intestines or both.

Care should be taken to differentiate the cases which are not getting sufficient milk from those in which the milk disagrees—when the milk is scanty the child wants to nurse for a long time, a half hour or longer or it may nurse a few moments and then turn from the breast with evident disgust and anger.

Usually after a week or so normal conditions obtain, but if they do not the problem of what the feeding of the child is to be must be settled. Experience helps a great deal and a careful weighing of the evidence at hand, the general condition of mother and child and the examination of the mother's milk, will usually point the way more or less clearly. If the mother's milk is of good quality but scanty and the child is gaining on mixed feeding this should be continued, using every effort to increase the mother's milk. If the milk is very poor in quality the child should be weaned. If the mother's milk is apparently normal or of good quality but scanty, and the child is doing badly, with loss of weight, stationary weight, colic, vomiting, diarrhea, or undigested stools, the child should be put on artificial feeding for a few days and the mother's milk kept going by using the breast pump or hand expression. If the symptoms cease and the child does well it should be weaned. If it does not do any better and the usual changes in the milk do not bring about an improvement we

continue mixed feeding a little longer or try to get some other human milk and see if the baby does well on that while it does badly on its mother's milk. If this is the case the child should be weaned. If the child is to be weaned it is important to do it before too much damage is done to its gastro-intestinal tract and nutrition, as it makes the subsequent feeding easier.

The mental attitude of the mother has a marked effect on the milk secretion, and if she has been properly instructed and encouraged beforehand, there is usually no difficulty. If, on the other hand, she has grave doubts as to her capability, and particularly if she hears both physician and nurse discuss her probable incompetency, the milk secretion may be inhibited. The mental condition of the mother is often affected as the result of weighing the child. It is very desirable that the child be weighed regularly and the weight recorded; but if the mother is at all nervous, or if the child is not doing well, the weighing should not be done by the mother or in her presence. A loss in weight, or even the fact that there is no material gain, may so affect the mental condition of the mother as to prove deleterious to the secretion of milk. With proper encouragement and by stimulating the breast by placing the child at it at regular intervals the flow of milk is promoted.

The subject of the fitness of mothers for nursing their infants is receiving more attention of late years, and in Germany an attempt has been made to show that the daughters of alcoholic parents or ancestry are apt to be incapable of nursing their infants. While this has been proved statistically, an alcoholic ancestry is of so common occurrence that almost any existing evil might be attributed to it and its relationship proved.

Many mothers with an abundance of maternal love and manifold good intentions are often lacking in intelligence and cannot be taught the proper care of an infant.

Breast-nursing often proves a failure because the mother does not understand how to give the breast to the child. With the increase in civilization there seems to be a diminution in instinct, and careful directions should be given in every case. The child should lie on the left or right arm, according to whether the child is to nurse at the left or right breast. If the mother is in a sitting posture the body should be inclined slightly forward. With her free hand she should grasp the breast near the nipple between the first two fingers. If, owing to the free flow of milk, the child takes the milk too rapidly, this may be checked by slight pressure of the fingers. The child should nurse until satisfied. The contents of one breast are generally sufficient for one nursing, and the breasts should be used alternately. When satisfied, the infant will usually fall asleep at the breast. Under ordinary conditions the nursing should last from about ten to twenty minutes. If the milk is taken too rapidly, vomiting may

ensue immediately after or during feeding. If too much is taken, it is regurgitated almost immediately. If the infant consumes more than half an hour in nursing, the breast and milk should be examined. As the infant grows older it requires and takes more food, and consequently will require a longer time to nurse than it did during the early days of life.

The inculcation of good nursing-habits cannot be too strongly insisted upon. Many attacks of colic, indigestion and diarrhea may be traced to improper nursing. When good habits are once established, there is generally very little trouble, the success of the training depending largely on the manner in which it is done. Regular hours for feeding should be fixed and adhered to; and if the child is asleep at the feeding-hour, it may be aroused, for it will almost invariably go to sleep after nursing. After the last feeding, which should usually take place at 9 or 10 o'clock, the child should be quieted and allowed to sleep as long as it chooses.

During the first month or two the infant will, as a rule, awaken between 1 or 2 o'clock and again at about 4 or 5 o'clock. After two or three months it will require but one night feeding, and after five months of age the average infant will sleep all night without nursing.

When the change is being made and the child awakens for its accustomed nursing, it should be given a little warm water from a bottle and be quieted, but not taken up. Regular nursing-habits induce regular bowel movements and sleep, and the three combined insure health and comfort not only for the infant, but for the mother as well. A healthy child, if trained to do so, will sleep without rocking or coddling. Three things are, however, essential to secure success in this training: a satisfied appetite, dry napkins, and a quiet, darkened room. The infant must not be nursed each time it cries. If it has colic, the warm milk may soothe the child for a time, but later aggravates the trouble, which in many cases is due to overfeeding or to too frequent feeding.

Weaning.—The child should be weaned only for very good reasons and practically never for minor disturbances, such as colic or slightly abnormal stools, as long as the child is gaining in weight. It is not necessary to wean the child for cracked nipples, as these, with proper treatment and the breast shield, are generally soon recovered from. The child should not be weaned on account of the mother's beginning menstruation, as this rarely has more than a temporary effect on the milk and usually not even that; nor should it be done for any of the ordinary mild diseases that may occur in the mother. There are, however, quite a large list of reasons for taking the child off the breast, among these being the presence of any acute severe disease in the mother or of any chronic wasting disease. In cases where the milk definitely does not agree with the child or where there is no gain in weight for a considerable period or even a loss of weight, the child is

better fed on artificial food than allowed to get in a very run down condition from lack of proper nourishment. In very many instances the mother attempts to nurse the child for too long a period and after the milk has either failed in quantity or quality or both. When the milk begins to fail it is a very good plan to begin mixed feeding and this may be increased and the child gradually weaned, generally without any difficulty whatever. As a general rule, the weaning should not be done in summer if it can be avoided, but the dangers of weaning a child in summer are very much over-estimated; provided it is done by some one who understands the subject of infant feeding. The chief danger of weaning in summer is the same danger that attends artificial feeding in general, and spoilt milk. The child should never be weaned in the spring if it is doing well, for fear it might have to be weaned during the summer months. If the child has been accustomed to taking one bottle a day the weaning is very easily accomplished. If this has not been the custom there may be great difficulty in getting the child to take the bottle, in which case the child should be fed by some one else when the mother is not present. Weaning may be accomplished in two ways: either by substituting one bottle for a feeding and then two bottles until the child is entirely off the breast, or the method advised in mixed feeding may be used, gradually increasing the quantity until the child is no longer nursed at all.

Wet-nursing.—With the advent of a more thorough knowledge of infant feeding wet-nursing has, fortunately, become less frequent. Nevertheless, there are some infants that will thrive on nothing but breast-feeding. When this is the case, a wet-nurse must be chosen according to the following rules:

The woman should be healthy and of good habits. The absence of syphilis, tuberculosis, alcoholism, and other diseases should be determined by careful examination. A Wassermann test should be made to determine the presence or absence of syphilis. The nipples should be carefully examined for fissures and ulceration. The breast should be examined before and after nursing, and the milk tested as previously described. The size of the breast alone is not a good guide as to the amount or quality of the milk it secretes. The quantity may be judged by the size of the breast before and after nursing or by weighing the baby before and after nursing. This latter method, although a good one, is not usually resorted to. The wet-nurse should always be one who has nursed her own child successfully for at least a month. If possible, she should be a primipara between twenty and thirty-five years of age. Younger or older women should not, as a rule, be employed. If the infant's condition permits, the nurse should be given at least a week's trial, for often the change in her mode of living may cause a scanty flow of milk or render it otherwise unsatisfactory. When she has become accustomed to her surroundings,

the milk may become perfectly normal. Owing to idleness and a too abundant diet the milk may become too rich. In these cases the rules previously laid down may correct the condition. Suitable wet-nurses are not easily obtained, are expensive, and are often a source of constant trouble and annoyance. A woman who will give up the care of her own child for pay is usually a very unpleasant person to have about. For these reasons, except where there is severe acute inanition, other means should be tried before a wet-nurse is resorted to. Suggestions for the operation of a breast milk dairy have been given by Chapin in volume 25 of the Transactions of the American Pediatric Society, 1923.

Mixed Feeding.—Children fed partly on the breast and partly on the bottle should always be under supervision. This method is indicated when the mother's milk is poor or scanty, owing to some intervening illness, or when owing to deficient quantity, the mother cannot entirely nurse the child. It is also used in weaning. If the mother is nursing the child but once or twice a day the milk is apt to become very poor and under these circumstances it should be examined from time to time. In these cases the child is satisfied after the bottle but not after nursing.

We usually allow one full feeding a day in place of a nursing and in the case of weak mothers and if the child is still getting a night feeding this is best given at night, otherwise at any time of the day that it suits the mother. At each other nursing period the child is put to the breast and left long enough to empty at least one of them. Immediately after this the child may be given a bottle containing the amount necessary to make up the feeding. This may be gauged by the child's being satisfied and contented after feeding or by weighing the child before and after the feeding and giving the difference between what it takes at the breast and a normal size feeding for the baby in question. If too much is given it will be vomited within a short time after feeding.

Partial Feeding with Human Milk.—It frequently happens that a wet nurse cannot be obtained, but nearly always it is possible to get one or more nursings from some friendly mother. From 1 to 6 or 8 ounces of breast milk added to the diet of the artificially fed child is often the means of saving the life of the child—the breast milk stimulating the nutrition as nothing else will. In cities such milk can often be bought at maternity hospitals by making special arrangements, and a similar plan may be successfully followed apart from hospitals. In premature, improperly fed young infants, inanition, marasmus, and in some other conditions this plan is of great value. (See Hoobler, Journal of the American Medical Association, Aug. 11, 1917, p. 421.)

Other Foods for Infants Under One Year.—Other foods than milk may be added to the infant's diet. Orange juice or the juice from

canned tomatoes may be given any time after the first ten days or two weeks. Sweet orange juice is preferable, but if it is somewhat sour, a pinch of sodium bicarbonate may be added just before it is given to the baby. Prune juice may also be given if there is constipation. At seven months cooked cereals may be given, starting with small quantities and increasing to several tablespoons. As soon as the child is used to this, add green vegetables, always starting with a teaspoonful first, as there are curious idiosyncrasies in some babies; later 1 or 2 tablespoonfuls may be given. The following is the list we use for this age:

Seven to Nine Months.

Foods permitted:

Breast or substitute.

Junket.

Orange or prune juice, strained stewed apples.

Any well-cooked cereal, as farina, cream of wheat, oatmeal, cream of rice, barley, cornstarch, arrow root or barley flour. Cook cereals thirty minutes over flame or one and one-half hours in a double boiler.

Crackers, toast, or zwieback, given dry or with milk.

Any green vegetable that may be passed through a sieve, as carrots, spinach, stewed lettuce, soft parts of cauliflower or asparagus, oyster plant, juice of stewed tomatoes. Vegetables should be cooked until soft.

Schedule:

6 A. M. or on waking: Breast or bottle.

8 A. M.: Fruit juice.

10 A. M.: Cereal, beginning with 1 ounce and gradually increasing up to 6 ounces. Breast or bottle.

2 P. M.: Vegetables, zwieback or toast bread, and bottle.

6 P. M.: Breast or bottle (cereal allowed after nine months if needed).

10 P. M.: Breast or bottle if required.

Nine to Twelve Months.

6 A. M.: Bottle.

8 A. M.: Orange juice, prune juice, or strained prunes (½ to 2 tablespoons).

10 A. M.: Bottle.

Cereal: Farina, cream of wheat, oatmeal, rice flour, cornstarch, or arrow root, 6 ounces.

1 tablespoonful cereal,
½ cup water,
½ cup milk,
1 pinch salt.

Boil for thirty minutes over the direct flame or one and one-half hours in the double boiler.

Crisp bacon (one-half to one slice).

2 P. M.: (A) Vegetable soup (6 to 8 ounces).

¼ pound beef, lamb, veal, or chicken,
1 potato,
1 carrot,
2 stalks celery,
1 tablespoonful pearl barley,
2 tablespoonfuls rice,
2 quarts water,
1 pinch salt.

Finely divide the vegetables. Add the vegetables, barley, and rice to 2 quarts water. Boil down to 1 quart, cooking three hours. Add pinch salt. Pass through fine sieve.

Or (B) Baked potato (1 teaspoonful to 4 tablespoonfuls) with beef juice (½ teaspoonful to 1 tablespoonful) and strained carrot, spinach, or squash (1 teaspoonful to 1 tablespoonful).

If (B) is used a bottle of milk may be given.

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6 P. M.: Bottle:
(A) Cereal, as 10 A. M.
Or (B) Toast or zwieback (one to two slices in part of milk mixture).
10 P. M.: Bottle (if required).

Artificial or Bottle Feeding.—If a baby cannot be nursed at the breast, how can it be fed so as to have it grow into a strong, healthy, normal child? This question has been the object of a great deal of study, and while much has been learned about infant feeding it would seem that there is much more to find out. The earlier methods of modifying milk consisted of mixing mixtures of water and milk, then sugar and water were added, and then cereal gruels with or without sugar. Buttermilk mixtures were used in some places. Liebig tried to get a mixture to add to milk to adapt it to the infant's digestion. Biedert and Meigs suggested mixtures to replace mothers' milk, and Rotch elaborated their ideas and suggested the study of milk mixtures from the standpoint of the percentage of protein, fat, and carbohydrate contained. Budin and others suggested undiluted cows' milk. Heubner approached the subject from the standpoint of the energy required by the infant, and suggested mixtures which in proper amounts covered the number of calories needed.

In practice it was found that sometimes milk not only did not agree, but at times caused positive injury. Seeking the explanation for this, Biedert suggested that the protein or curd was at fault. Later, Czerny thought the trouble was due to the fats, especially if given in too great quantities. He believed that the large quantities of fat used up too much of the alkali in the intestine in saponifying it, and so brought about a condition of acidosis and of gastro-intestinal disturbance. Later, Finkelstein and his school taught that the sugars were the cause of the trouble. His theories are considered somewhat more fully below. Still others believe that the difference in the character and amounts of the inorganic salts are responsible for the trouble in feeding. The bacteriologists are of the opinion that bacteria are the cause of the trouble, and at times the disturbance is due to the toxic disturbances which the bacteria cause to be formed in the milk. Still others blame the difference in ferments and other specific characters of the milk, claiming that these specific differences in the milk of various animals are at the bottom of the trouble. Again, the quantities, the hours, and methods generally have been blamed. Sometimes one of these things is the cause and sometimes another.

The Problem of Artificial Feeding.—This subject may be approached in much the same way as feeding adults. The aim of such feeding is to produce a healthy, normally developed child with the proper resistance to disease. There are a number of important theoretic considerations with which any one supervising the feeding of infants should be familiar, but it should always be borne in mind that the

practical clinical result is to be the final criterion and not the theoretic standards.

We shall consider first the most important of the theoretic considerations and then the practical infant feeding. The reader should first read the sections on cow's milk.

The Caloric Needs of Infants.—The total caloric needs of infants have not been definitely determined, and infant feeding can be done successfully without any knowledge of calories. However true this may be, the study of infant feeding from a standpoint of the caloric needs adds greatly to its interest, and is a valuable check on under- and over-feeding. It must be borne in mind that the food must not only contain the requisite number of calories, but it must be digestible, absorbable, and capable of being utilized by the baby without causing any untoward symptoms. Finkelstein observed that the average breast-fed infant draws daily during the first week of life one-fifth of its body-weight; from the sixth week to the sixth month, one-sixth to one-seventh, and during the latter half of the first year, one-eighth of its body-weight. Expressed in round numbers per kilo of body-weight, during the first three months it receives 150 c.c., during the second period somewhat less, and during the third period 120 to 130 c.c. Expressed in Heubner's energy quotient—that is, in calories per kilo of body-weight—the requirement during the first three months is 100 calories per kilo (45.4 calories per pound), during the second three months between 100 and 90 (40.9 calories per pound), and during the latter half of the first year 80 or a little less per kilo (36.4 calories per pound). Artificially fed children are supposed by some to need more than breast-fed children on account of the supposed greater work required in assimilating cows' milk. Heubner suggests 120 calories per kilo. The other figures, however, seem to cover the needs of healthy infants as demonstrated in practice. The needs of older children have been given under Age and Food Requirements.

The requirements vary greatly under different conditions. Thus, an infant that sleeps a great deal will require less food than one who is wakeful, and the high-strung, nervous, very active child requires considerably more than either. The reason a child requires so much more per kilo of weight than an adult depends largely on the fact that the proportion of surface is greater in the small body. A certain amount is needed for growth, as it has been variously estimated that from 9 to 15 per cent. of the food taken was retained for the purpose of forming new tissue.

Atrophic children and those under weight for their age require more per kilo than the normal child. Some observers have fed as high as 170 calories per kilo in order to secure a proper gain in weight. Such feeding should only be done when under very careful supervision, as excessive quantities of food are liable to cause digestive disturbances.

Caloric Need of Premature Infants.—Hess and others have studied this question, and believe that premature infants require more food proportionately than the full-term baby. The need varies inversely with age and birth weight. From practical observation those babies weighing over 1500 grams at birth require from 100 to 132 calories per kilo of body-weight; those weighing under 1500 grams, from 115 to 170. These doubtless vary greatly, and such high caloric feeding should not be attempted at first, but the amounts should be small, and increased as the infant's digestion warrants it.

The Determination of the Caloric Value of Modified Milk.—Moorehouse has given a very simple method for estimating the caloric value of infants' food when the total quantity of the percentage formula is known. The method is as follows: Reduce the twenty-four hour amount to cubic centimeters, one ounce being equal to 29.5 c.c. Next determine the number of grams of fat, sugar, and protein in the mixture by multiplying the number of cubic centimeters and the daily amount by the percentages of fat, sugar, and protein. The calories from each constituent may be determined by remembering that a gram of fat furnishes 9.3 calories, and a gram of sugar or protein furnishes 4.1 calories. The calculation may be simplified by expressing the arithmetical process by equations, thus: Calories from fat equal $Q \times F \times 2.74$; calories from sugar and protein equal $Q \times (S + P) \times 1.21$. The sum of these two values gives the total calories furnished by the mixture, and this figure divided by the weight of the child in pounds gives the calories per pound per day. In the above formula Q equals the twenty-four-hour amount in ounces, F, S, and P the percentages of fat, sugar, and protein expressed as whole numbers; for example, 1 per cent. equals 1 and not 0.01.

Fraley's Method.—This is not strictly accurate, but sufficiently so for all practical purposes. In calculating milk mixtures he uses the following formula:

$$(2F + P + S) \times 1\tfrac{1}{4}\, Q = \text{Calories.}$$

or twice the fat percentage plus the protein percentage, and the sugar percentage multiplied by 1¼ times the total quantity gives approximately the number of calories. For example—

16 per cent. cream	2	ounces.
Milk	14	"
Milk-sugar	1	"
Diluent to	32	"

This gives, by Baner's method, fat 2.75, protein 2, and sugar 5.1. Using Fraley's formula, $5.5 + 2 + 5.1 = 12.6 \times 40 = 504$.

Using the ordinary calculations—

2 ounces cream	100	calories.
14 ounces milk	280	"
1 ounce milk-sugar	125	"
	505	"

If the caloric value per ounce is desired the Fraley formula may be used thus: $2F + P + S \times 1\frac{1}{4} =$ Caloric value per ounce.
Holt and Howland suggest using $1\frac{1}{3}$ instead of $1\frac{1}{4}$ in this formula. For example, woman's milk with a formula of 4 per cent. fat, 2 per cent. protein and 7 per cent. sugar would yield $2 \times 4 + 2 + 7 = 17 \times 1\frac{1}{4} = 21.25$ calories per ounce.

A simpler method is to know the caloric value of common foods. Mothers' milk is estimated at from 650 to 700 calories per liter, or about 22 calories per ounce. Cows' milk is generally estimated at 20 calories per ounce for market (4 per cent. fat) milk.

Approximate Caloric Value of Different Foods.

	Calories per ounce.	Level Table-spoonfuls.	Grams of Protein per ounce.
Woman's milk	20	..	0.56
Cows' milk	20	..	0.90
Cream (20 per cent.)	60	..	0.70
7 per cent. milk	27.5	..	0.90
6 per cent. milk	25.0	..	0.90
5 per cent. milk	22.5	..	0.90
4 per cent. milk (whole milk)	20.0	..	0.90
3 per cent. milk	17.5	..	0.90
2 per cent. milk	15.0	..	0.90
1½ per cent. milk (skimmed milk)	13.5	..	0.96
1 per cent. milk	12.5	..	0.96
Fat-free milk	10	..	0.96
Whey	10	..	0.28
Sweetened condensed milk, 1 fl. oz.	127	..	3.50
Sweetened condensed milk, 1 oz.	95	..	2.50
Evaporated milk	55	..	
Dried milk (Mammala)	127	16	
Milk-sugar	120	40	
Cane-sugar	120	60	
Dextrimaltose	120	40	
Malt soup extract	80	40	
Barley flour	109	35	
Wheat flour	107	28	
Oat flour	115	40	
Soy flour	120		12.4
Barley-gruel (1 to 16 oz.)	7.5		
Barley-water (1 tbsp. to 16 oz.)	2.5		
Albumin-water (white 1 egg to 1 pt.)	1	..	0.2
Meat juice	6		
Orange juice	15		
Olive oil	245	122	

Approximate Measures.

Milk-sugar	3 level tablespoonfuls	=	1 ounce by weight.
Cane-sugar	2 " "	=	" "
Dextrimaltose	3 " "	=	" "
Barley or oat flour	3 " "	=	" "
Wheat flour	4 " "	=	" "
Soy flour	3 " "	=	" "

Budin's Simple Rule.—This is easily remembered—one-tenth the body-weight in twenty-four hours. If the body-weight is 10 pounds,

it will require 1 pound or 1 pint of milk in twenty-four hours, or from $1\frac{1}{4}$ to $1\frac{1}{2}$ ounces of milk per pound of body-weight. This is a little under the figure given above, but the sugar, generally added, brings it up to the required amount.

Protein Requirements.—From the data at hand it is not possible to state what is the best amount to be used under various conditions. Howland is of the opinion that from 8 to 10 per cent. of the total calories should be supplied by protein. Talbot states that the average infant requires 1.5 grams of protein per kilogram or 0.7 gram per pound of body weight, while many require at least 2 grams per kilogram or 0.9 per pound and some 2.5 grams and others evidently even more than this. Inasmuch as cows' milk seems to be somewhat deficient in certain amino-acids necessary for growth and which are supplied by the protein of human milk, and also in view of the fact that the protein of cows' milk is usually well digested and causes no untoward symptoms even if given in excess, it is well to be on the safe side and give rather a little too much than too little. One and a half ounces per pound of body-weight will cover the nitrogen needs of the average baby. The dangers of feeding too little protein are anemia, no gain in weight, or too small a gain, and a lack of resistance. Babies fed on low protein diets may weigh enough, but are not as strong muscularly nor as active as the normal infant. Excessive amounts of protein usually cause constipation with large stools and high protein feeding may be used in certain diarrheal disturbances.

Fat and Carbohydrate Requirements.—The difference in the food must, of course, be made up of fat and carbohydrate. The best results are obtained by using both fat and carbohydrates. In average healthy infants about 10 per cent. of the total calories requirement will be supplied as protein, and of the remaining 90 per cent. of the calories about 50 per cent. may be advantageously given as fat and the remaining 40 per cent. as carbohydrate.

One must bear in mind that the ultimate aim is to feed the baby successfully, and infant feeding should not be regarded in the light of a mathematic game. These figures are based on successful feeding carried on at first without any regard for calories. The expression of results in calories will, however, be found both interesting and useful. To avoid repetition the remainder of this subject will be considered below under the heading of Percentage of Fat and Carbohydrate.

Mineral Salts.—Of late these have come in for considerable attention, and many disorders of nutrition are supposed to be due to disturbances in the equilibrium or balance of the various mineral constituents in the body. At present our knowledge is a little too vague to permit any very definite rules, but a diet low in inorganic constituents should not be given a growing child. It seems that, just

as in the case of nitrogen, balances may be fixed at various levels; that is, if the diet is rich in salts a large amount is excreted, and if it is poor in salts, less. Below a certain level it is not well to go (see Salts). The salts are important in building up the tissues. Calcium phosphate and magnesium are most important.

These salts are present in sufficient quantities in mothers' milk and in cows' milk. In modifying cows' milk, reducing the protein reduces the calcium to the correct amount; but such dilution reduces the magnesium and the iron below the normal requirements.

Calcium Metabolism in Infants.—According to Holt, Courtney, and Fales[1] the amount of calcium is dependent on the intake, from 35 to 55 per cent. being absorbed. The average absorption of calcium oxid in the breast-fed infant was 0.06 gm. per kilo, which may be taken as a minimum for infants fed on cow's milk mixtures, who generally absorb 0.09 gm. per kilo. To insure this the breast fed must have an intake of at least 0.13 gm. per kilo, and the bottle fed an intake of 0.19 gm. per kilo. The best absorption takes place when the calcium had a definite relation to the fat intake, that is, when there was 0.045 to 0.060 gm. of calcium oxid for every gram of fat, and when the fat intake was normal, not less than 4.0 gm. per kilo. Any excess is excreted and deficiency in the diet causes a deficiency in the body. Calcium absorption is low in diarrhea and in rickets. When cod-liver oil is given the calcium intake is increased.

The iron in the food given most infants is too low; but the ill effects are not seen, as a rule, as the baby starts off with an excess of iron. If exclusive milk feeding is kept up too long, anemia results, as is often seen in infants from one and a half to three years. Iron may be supplied best in yolk of egg or in meats, or it may be given in one of the usual forms. Magnesium may be supplied by using legume flours or wheat preparations. Vegetable broths are rich in salts. Lists showing the salt-content of various foods will be found under the heading of Salts.

Calories and Percentages.—There has been a great deal said about the caloric method of feeding and the percentage method. These are not methods of feeding, but methods of expressing what is being done, and their use should make the problem more clear. The caloric value of foods is important, as it enables one to estimate whether the baby is getting insufficient food or too much before signs of actual trouble occur. The percentage method of dealing with the subject is valuable because it gives us a method of expressing accurately and concisely what the baby is getting. It gives us a basis for changing the composition of the food to suit the needs of the individual infant.

Tolerance for Food.—The success or failure of the physician will depend largely on his ability to adapt food to the digestive capacity

[1] Amer. Jour. Dis. of Children, xix, 97, February, 1920.

of the individual infant. One might say that every baby is more or less like every other baby. For infant feeding one might more truthfully state that every baby is more or less different. The differences are not always apparent, because there is a rather wide range in which the average baby will thrive. That is, it is capable of growing under more or less adverse circumstances, and of utilizing more or less improper foods. These variations have definite limits in both directions as regards the composition and amount of foods. Within the limitations the baby thrives; if the limit is overstepped the infant becomes ill. Babies living in the country, out of doors, often have wide limits of tolerance. The dweller in the over-heated, underventilated city flat usually has narrow food limitations. Disease changes the tolerance for food often in a remarkable way. Foods of a composition and quantity which ordinarily agree very well may actually cause disease when given in certain diseased conditions. Lactose, for example, in normal babies is assimilated readily, but if the intestine becomes damaged it may be the cause of a rather definite disturbance of metabolism, which has been described as sugar-poisoning.

It is not possible to modify the food to suit all the differences of metabolism and constitution. We cannot always tell what the trouble is when we know there is something wrong, but we can, by keeping within certain limits, prevent much trouble, and careful study and experiment often correct existing disturbances.

The Composition of Milk.—In the United States the only milk which is available for infant feeding is that from the cow. To insure success in infant feeding, one should know its composition, how it compares to mothers' milk, and how to modify it to suit it to the individual infant.

Comparison of mothers' milk and cows' milk:

	Average woman	Average cow
Protein	1.50	3.50
Fat	3.50	4.00
Sugar	7.00	4.50
Salts	0.20	0.75
Water	87.80	87.25
	100.00	100.00

In the first place there are differences which are not apparent. Women's milk contains ferments which stimulate the digestive secretions in the child. Those of cows' milk stimulate the digestion of the calf, not of the infant. In some difficult cases even a small amount of women's milk will be found of great service in stimulating the digestion.

The Protein.—This differs both in amount and in character. In women's milk the proteins consist of lactalbumin and casein in the proportion of two-thirds of the former to one-third of the latter. In

cows' milk about one-sixth of the protein is lactalbumin and the remainder casein. The total protein in human milk precipitates in fine flakes, that of cows' milk in heavy curds. The modification of the protein consists in diluting the milk until the protein is from 0.6 per cent. or more, according to the age, size, and digestive capacity of the infant. In some cases the lactalbumin and curd may be separated and added in the required amounts.

The protein may be prevented from forming large curds by the addition of lime-water, sodium citrate, barley, or oatmeal-water. With the smaller percentage this is not necessary.

Sugar.—Milk-sugar or lactose is present in a very constant proportion in mothers' milk—from 6 to 7 per cent. In cows' milk the sugar averages about 4.50 per cent. Diluting cows' milk reduces the sugar still farther, so that sugar must be added to make up the percentage. This is not added to sweeten the milk, but to increase its food value. During the first few days of life sugar may be given in the proportion of 5.0 to 5.5 per cent.; from the second week to the third month, 6 per cent.; and from that time up to the eleventh month, 7 per cent. may be used. At the eleventh month it may be reduced to 5, and a little later omitted altogether, unless the child is under weight. These are safe limits, both from the standpoint of nutrition and tolerance. Some infants will tolerate more than 7 per cent., but there is no advantage in giving more, and it may give rise to symptoms of sugar-poisoning.

There has been a great deal of discussion about the kind of sugar to be used. Lactose, the sugar found in milk, is best for normal infants. It may be given in sufficient amounts more easily than the other sugars, as it is not so sweet. Care should be taken to get a pure sugar. Milk-sugar may cause trouble if there is digestive disturbance, even in the amounts mentioned above, and one of the other sugars or other carbohydrate (as starch) may then be substituted. In the severe diarrheas the starch foods (as barley or rice gruel) are better borne.

Cane-sugar is cheaper and often substituted for lactose in ordinary feeding, but it is so sweet that only about half as much can be used. In some cases it is apparently digested better than lactose.

Maltose is much used at present in place of the above. It is generally given in mixtures containing dextrose as well. If maltose is used, it should be begun in small quantities and increased to the desired quantity, as it sometimes causes diarrhea and other disturbances, particularly if any gastro-intestinal trouble exists. In such cases it should be used with great care. It ferments very easily. It has the advantage of being readily assimilated, as is especially indicated in loss of weight or stationary weight without apparent cause.

The following is said to be the composition of some of the most frequently used preparations containing them:

	Maltose.	Dextrose.
Soxlet's Nahrzucker	52.44	41.21
Loefland's Nahrzucker	40	60
Dextri-maltose	51	47
Neutral maltose (Maltzyme Co.)	63.66	8.9
Loefland's malt soup	58.91	15.42
Borchardt's malt soup	57.51	15.76

Other analyses of infants' foods containing maltose and dextrose will be found under the heading of Proprietary Foods.

Glucose solutions are sometimes used by the drop method by rectum, either with or without salt solution. (See Rectal Feeding.)

The subject of the different sugars in relation to the various intestinal disturbances needs further study. (See also Finkelstein's theories.)

Fat.—The fat of human milk averages 4 per cent.; that of cows' milk is the same. When the milk has been diluted, the amount must either be made up by adding cream or by using the upper one-third or upper half of the milk after the cream has risen. Gravity cream contains about twice as many bacteria as centrifugal cream, and the objections formerly urged against the latter appear to be unfounded.

The amount of fat to be given varies with the age, weight, and digestive ability of the infant. For an average infant, 2 per cent. the first week, 2.5 per cent. the second, and 3 per cent. the third week are the amounts usually prescribed. In using whole milk mixtures the amount of fat is low, and as fat is most frequently the stumbling block in digestion, these mixtures are easier to adapt to the infant's digestion. If the child is under observation there is no objection to raising the fat to 4 per cent. at about the fourth month, after that time this amount must not be exceeded, or the infant is apt to develop indigestion, with the large whitish stools giving off the characteristic odor of the fatty acids.

The Calculation of Percentages in Milk Mixtures.—This is needed if one thinks in percentages, and a simple rule is given by Holt as follows: To determine the percentage of any constituent in the food, multiply its percentage in the original milk, cream, or milk by the number of ounces of each in the food, and divide by the total number of ounces of food prepared.

For example, a 40-ounce mixture, made up of 20 ounces of the upper half of market (4 per cent.) milk; that is, of 7 per cent. milk, 20 ounces of water, and $1\frac{1}{2}$ ounces milk-sugar:

$7 \times 20 = 140$ represents fat in mixture,
$140 \div 40 = 3.5$ percentage.

The protein in 7 per cent. milk is about 3.50 per cent.:

$3.50 \times 20 = 70$ represents protein in mixture,
$70 \div 40 = 1.75$ percentage of protein.

The sugar in a 7 per cent. milk is about 4.50 per cent.:

$$4.50 \times 20 = 90 \text{ represents sugar in milk,}$$
$$90 \div 40 = 2.25 \text{ percentage of sugar in milk.}$$

$1\frac{1}{2}$ ounces of milk-sugar in 20 ounces adds about 3.75 ($1.5 \div 40 = 0.0375$). The total sugar is $2.25 + 3.75 = 6$ per cent.

The Use of Alkalis.—Formerly alkalis were much used in infant feeding. With a better understanding of the subject these are not often required. The subject of alkalis in infant feeding is fully discussed in the fifth edition of this work. If alkalis are needed, as in cases where the stools are acid and are causing chafing, or where there is colic due to hyperacidity, or where there is persistent sour vomiting, it should be added immediately before feeding, as alkalis destroy the vitamins if in too long contact with them. Alkalis are sometimes added to prevent cow's milk from forming such large curds. It has been estimated that adding 5 per cent. lime-water to milk will render it alkaline, whereas 20 per cent. will check the digestion of protein in the stomach entirely. With sodium bicarbonate 1 grain to the ounce renders the milk alkaline, 2 grains to the ounce facilitates the gastric digestion of protein by changing the character of the curd, while 8 grains to the ounce will suspend the gastric digestion of protein. Sodium citrate in the same dosage is very useful to overcome the large tough curds in hyperacidity and where the stools have a tendency to be green. Magnesia either in the form of the milk or syrup is often used, especially where the combined effect of an alkali and a laxative is desired. Potassium bicarbonate is also used, especially where there is constipation. As a general rule the less alkali used, the better.

The clotting may be changed mechanically by adding a gruel made of barley flour or other cereals. It is sometimes an advantage to dextrinize the gruel to render it more digestible.

Boiling milk is sometimes practised in order to change the curd. Boiled milk is often useful where there is a tendency to frequent stools. In some children it produces marked constipation.

Acid milk, as buttermilk or kumiss and similar preparations, are often used when ordinary milk mixtures are not well borne. The protein is precipitated in fine curds and is easily digested, as the digestive juices can affect it easily and the rennet does not cause further clotting.

Practical Infant Feeding.—Having considered the more important principles on which infant feeding is based, we are in a position to consider it practically.

Pure Milk Essential.—It should be borne in mind that pure, clean milk is essential to infant feeding. This has been considered in the article on Milk. The person caring for the child should be carefully instructed on this point, and the milk selected should be the best

obtainable. It is always cheapest in the end. Careful instruction should also be given about keeping the milk cold, about sterilizing the bottles and all the utensils that are used in the preparation of the baby's milk, so as to avoid contaminating it. If very pure milk is obtainable, it may be used raw, if there is any doubt, it should be pasteurized (see Milk), and if it is very doubtful, it should be sterilized by boiling. We do not believe that milk that needs boiling (unless to keep it in the absence of ice) is fit for infant feeding; but in spite of all that can be done some people will use it.

It is a good plan to test the milk occasionally to ascertain the fat-content.

The directions for preparing the food should be written out, showing the quantity of each ingredient, the number and size of feeding, etc. Always make certain that the directions are clearly understood.

Bottled Milk and Bacteria.—Hess has found that the bacteria are far more numerous in the upper layers of the cream, and that they become gradually fewer in its lower portion. The upper 2 ounces of the cream contain the greatest number of bacteria, and this is true of the tubercle bacilli, as well as of the streptococci and other bacteria. He suggests that in place of using the upper cream, as ordinarily practised, it is better to discard the upper two ounces. The average bottle of such partially skimmed milk contains 2 per cent. of fat and 3.5 per cent. of protein. The top 7 ounces of what remains in the bottle contain 12 per cent. of fat, 8 ounces of 10 per cent. fat, and 12 ounces of 7 per cent. fat. These portions of the milk may be used in the ordinary percentage mixtures.

Substitutes for Milk.—If pure milk cannot be obtained, it is better to use one of the dried milks, either those made by the Hatmaker or the Merrill-Gere methods. (See Dried Milk.) Condensed milk, either sweetened or unsweetened, or malted milk may be used temporarily. When these latter are used, it is well to give orange or tomato juice to prevent scurvy and cod-liver oil to prevent rickets. Soy gruel may be added to condensed milk to advantage, both for its fat and protein content.

Interval for Feeding.—This is the same as in the breast fed. Long intervals, *i. e.*, four hours, are useful in atony of the stomach and when the gastric digestion is weak. In infants who are very small the interval may be shorter, and during illness, when only a spoonful or two of food can be given at a time, the interval may also be shortened. Regular feeding is very important. During the day the baby should be fed on schedule whether it is awake or not, as it will otherwise wake at night for the bottle it has missed. Night feeding should be omitted as early as possible. If sufficient food is given during the day, the baby may be allowed to sleep all night if it will. Normal babies do not need the night feeding after the fifth month, and it can

often be dispensed with after the third. Small babies and atrophic ones need the full number of feedings, as they require more milk to make them gain.

The Quantity.—The total quantity of mixture to be given depends on the size and age. The normal infant requires about 3 ounces of fluid per pound of weight during the first 4 months and about 2½ ounces per pound later and in late infancy 2 ounces per pound. As a general thing we increase the strength of the mixture, the quantity alternately, but there are exceptions to this. The size of each feeding will depend on the baby and on the interval used. The easiest way is to figure the total number of ounces of food for twenty-four hours, and divide it into the requisite number of feedings, five, six, seven, or eight, as may be determined upon. The size of the feeding may at times seem a little larger than the stomach capacity, but this is not of importance as long as there is no vomiting, as some of the milk passes out of the stomach before the last of the feeding is taken. The following are about *maximum* feedings:

Pounds weight.	Ounces of food.
6	2–3
7	3
8	4
9	5
10	6
11	7
16	8

The following figures of Ladd are of great interest, as they show how the atrophic baby needs more food before it will gain in weight:

Normal average infant weighing at	Pounds.		Ounces.	Atrophic infants, corresponding weights, received on an average. Ounces.
1 week	6	receive	1	3¼
1 "	7	"	2	4
3 weeks	8	"	2½	4½
5 "	9	"	3	4½
7 "	10	"	3	5¼
9 "	11	"	3½	5¾
3 months	12	"	4	6¼
3½ "	13	"	4¼	7
4¼ "	14	"	4½	6
5 "	15	"	5½	6
6 "	16	"	6	6½
8 "	17	"	7	7
9 "	18	"	8	7¼
10 "	19	"	8	7½
11 "	20	"	8	7
12 "	21	"	9	7¾
13 "	22	"	9	8

The regulation of the size of the feeding is important. The stomach is an elastic bag, and what might be regarded as a normal capacity varies within certain limits. If too much is given at a feeding, some of it will be regurgitated soon after. (See Vomiting.)

When this is the case, the size of the feeding should be reduced. Infants improperly fed are usually hungry all the time, and take readily almost any amount, merely to regurgitate it soon after. It is a common mistake to give these babies too large feedings. Only as much as can be retained should be given. These babies usually have atonic stomachs from taking feedings that are too large. At first the feedings in these cases should be small and the interval long. Strychnin in proper doses is of great value in these infants. The size of the feeding and the interval should be approached to the normal average as rapidly as possible, but the individual requirements should never be lost sight of.

Ssnitkin, of St. Petersburg, has estimated the amount to be fed to a child according to the weight. He ascertained that a baby's stomach held about one-hundredth of its weight at birth, and that the increase amounted to about a gram a day. By taking one-hundredth of the initial weight at birth and adding a gram for each day the average amount required for each feeding is ascertained. This is a fair working rule, but practically the amount is easily determined by the methods already described.

Beginning Bottle Feeding.—When the baby is weaned it should be done gradually if possible, as this gives the digestive organs an opportunity to become accustomed to the new milk gradually. The digestive juices are secreted as needed, and the stimulus comes from the food. Sometimes, if an entirely different food is substituted suddenly, the digestive juices are not equal to the demand and indigestion results.

To avoid this, all the food elements should be begun very low. The first day half the required strength, the second day somewhat stronger, and so on each day until the proper food is reached. Some babies will take only a day or two to make the change, others will require a week or more.

The aim should be to produce a firm, healthy looking baby, and not a fat, flabby one. The foods should be increased as indicated, keeping in mind the presence or absence of vomiting, the number and character of the stools, the gain in weight, and the general appearance. A baby that does not look well and contented has something that needs correction. It may be in the food or in the general surroundings or care.

If the baby is getting along well, it gains in weight following approximately the normal weight curve. It sleeps well, and is happy and looks contented. The stools are normal and there is no vomiting. If the baby is not doing well, the picture is just the reverse. There is little or no gain, and the child looks pale or flabby and unhappy. There is usually fretting, crying, restless, disturbed sleep, often vomiting, and bad stools.

Feeding Premature Infants.—Premature and very small babies

need especial care in feeding. If the baby is strong enough to nurse the breast, it should be weighed before and after nursing to determine how much is taken. It is not necessary to undress the baby for this. As the sucking efforts are feeble, the breasts should be emptied either by manual expression, by the use of a breast-pump, or by having another infant suck the breast. Julius Hess suggests that another infant be allowed to suck the other breast at the time the premature infant is sucking the one reserved for it. This stimulates the flow of milk. Care should be taken not to allow overfeeding where this is done, and the size of the feeding should be controlled by weighing. If the infant is too weak to nurse the breast, it may be fed from a bottle, with a medicine-dropper, a Breck feeder, or by gavage (see same). We have found the Breck feeder satisfactory. It is a small tube with a small nipple on one end and a rubber bulb on the other. By pressing the bulb small amounts of milk may be forced into the infant's mouth. Unless there is some defect in development this is almost always swallowed. If small nipples are unobtainable the rubber part of a medicine-dropper may be perforated and used.

Premature infants should not be fed until the bowels have moved. A small enema may be necessary, and some advise 5 drops of castor oil. The child should be fed four or five times during the first day. After that the schedule will have to be fixed to suit the individual baby. (See Caloric Needs of Premature Infants.)

During the first days it is important to feed the baby as much as possible in quantity, but it is equally as important to keep the size of the feeding within the child's digestive capacity and avoid *vomiting* or *cyanosis* from overdistention. During this period it may be necessary to dilute the milk or to partially skim it if very rich. The feeding may be started at 1 dram (4 mils.) and increased ¼ teaspoonful at a time if possible to do so without untoward effects. It is satisfactory during this period if the weight can be held stationary, and considerable initial loss is to be expected. The amount fed should be increased until the infant's needs are covered. There is some difference of opinion regarding this. The fluid needs may be estimated at one-sixth the body weight a day, and Budin suggested feeding one-fifth the body weight each twenty-four hours. Budin gives the table (p. 288) showing the amounts taken by actual infants of various weights.

The number of feedings must be suited to the individual infant. We usually feed them every two hours during the day and three hours at night, ten feedings in the twenty-four hours. Some do better on a three-hour schedule, eight feedings in twenty-four hours. The amount of tiring, vomiting, cyanosis, the general condition, and the amount ingested in twenty-four hours when using any special schedule are the things upon which judgment is based. If the baby gains, it

is satisfactory. The gain is usually between 2 and 6 drams (18–23 mils.) a day.

Age, days.	Weight less than 1800 grams (about 4 pounds). 11 infants. Ounces.	Between 1800 and 2000 grams (4 to 5 pounds). 31 infants. Ounces.	2200 to 2500 grams (5 to 5½ pounds). 25 infants. Ounces.
2	4	4½	6
3	5½	6	8½
4	7½	8	10½
5	8	11	11¾
6	8¾	11¾	12½
7	10	11¾	12½
8	10	12½	13
9	11	13	14½
10	11½	14½	15

Human milk is essential when obtainable, water and sugar mixtures may be tried, peptonized boiled milk, dried milk, or buttermilk mixtures are often used.

A formula often used, especially in German clinics, is:

Buttermilk,	1 quart,	1000
Flour,	3 teaspoons,	10
Cane sugar,	2 level tablespoons,	40

To begin feedings:

Buttermilk,	1 quart,	1000
Flour,	1 level tablespoon,	15
Cane sugar,	4 level tablespoons,	60

For later feedings:

These are boiled five minutes.

Dextrimaltose may be used in place of cane sugar.

Chymogen or Fairchild's essence of pepsin may be added to milk that has been boiled five minutes and allowed to cool to 104° F. One teaspoonful is added to a quart of milk; after standing fifteen minutes the curd is beaten or churned until finely divided. After making, it should not be heated above 100° F., or it will curdle and not pass through a nipple. It becomes bitter as it gets older, but if the child will take it, this makes no difference.

Where gavage is used the catheter should not be passed more than 4 inches, and Hess suggests not more than 3 inches. This will not enter the stomach, but is far enough in for feeding. Four-hour schedules are often used when the infant is fed in this manner.

MILK MODIFICATION

METHODS OF PRACTICAL VALUE IN MODIFYING MILK

After obtaining a careful history of the child and its family in order to estimate the effect of possible inherited diseases and of the previous foods used and a careful physical examination to determine the presence or absence of diseases, the food formula may be thought out. The age, the size, the general appearance, the condition of the digestive tract, the nature of the stools, all play a part in the decision. If the child has not been gaining or is upset it is well to avoid making the errors in diet responsible for the trouble.

First, determine the number of feedings, usually six, but variations between four and ten may be used. Next, fix upon the total quantity based on the rule of three ounces per pound during the first four months, two and a half later, and two in late infancy. The total quantity should not exceed forty-eight ounces during the first year and many pediatrists set the limit at forty-two. The total quantity divided by the number of feedings gives the size of each feeding. This will fall close to one ounce more than the baby's age in months and should rarely exceed eight ounces. If the baby gets too much at one feeding it will regurgitate it within five or ten minutes. This may also be caused by moving the baby about after feeding or from the baby's taking the milk too rapidly. Marantic babies take large feedings, but part of the milk passes almost directly into the intestine, and care should be taken not to dilate the stomach of a weak infant by too large feedings.

It is a rather general custom to start the feeding with cows' milk, and what has been said under the caption of Beginning Bottle Feeding should be borne in mind. A simple rule is to give the child twice as many ounces of milk as it weighs in pounds for the smaller ones, and an ounce and a half per pound for the larger ones. A better plan is to estimate the caloric needs of the infant (see Caloric Needs of Infants). This is done by multiplying the weight in pounds by 45 for children under three months, by 40 for children between three and six months, and by 36 between six and twelve months. If the child is under weight or very active it may require more and premature or very small sized infants may require 50, 60 or even 70 calories per pound.

The first thought is sufficient protein and one and a half ounces of cows' milk per pound will ordinarily supply the required amount. For example, a child of fifteen pounds ordinarily would require 15 times 40 or 600 calories. An ounce and a half of milk for each pound would be twenty-two and a half ounces, which at 20 calories per ounce would be 450 calories, leaving 150 to be supplied by the addition of some other food. Sugar is added up to 5 per cent. of the total quantity of food to make up the difference needed. An ounce of sugar (2 level tablespoonfuls if cane sugar, or 3 if milk

sugar or dextrimaltose) will furnish 120 calories and an ounce and a quarter would make up the required quantity. The formula would then be

Whole milk,	23 ounces
Boiled water,	13 "
Cane sugar,	2½ level tablespoonfuls

This formula would not be suited to start with if the child had not been taking cow's milk, but similar ones much weaker should be used based on 35 calories per pound or even less for a few days until the infant's digestion becomes accustomed to the new food, when it may be increased to the required amount. The child should not be kept on the low value foods too long. In this way a formula may be worked out as a starting point, and as the factor of safety of the nutrition of the average healthy baby is a wide one, most infants will thrive on such mixtures.

Another example: Baby's weight 10 pounds. Baby's age two months.

Milk requirements, 1.5×10	= 15
Number calories required, 10×45	= 450
Calories from milk, 15×20	= 300
Calories from sugar,	150
Amount of sugar in ounces ($150 \div 120$)	= 1.25

Formula as written for mother:

Whole milk,	15 ounces.
Water,	15 "
Sugar,	1¼ ounces or 2½ level tablespoons.

Make six bottles, 5 ounces each. Feed every three hours.

This could be just as well divided into five bottles of 6 ounces each and given every four hours.

Julius Hess[1] suggests the following as a guide to feeding the infant during the first weeks. The formulæ are low in caloric value so that they will not tax the infant's digestion. As soon as a tolerance for

Diet for Newborn Infants During the First Four Weeks of Life

	1st 48 hours.	3-4 days.	5-6 days.	7-9 days.	10-12 days.	13-14 days.	3d week.	4th week.
Milk (whole), ounces...	..	..	...	3	4	6	8	11
Milk (skimmed), ounces.	..	6	8	5	4	4	2	...
Sugar (cane), drams...	1	1	2	2	2	3	4	6
Water (boiled), ounces..	16	10	8	8	8	8	8	10
Calories in mixture.....	15	81	118	148	158	215	250	321
Feedings:								
Amount in ounces....	1	2	2.5	2.5	2.5	3	3	3.5
Number daily........	6	6	6	6	6	6	6	6
Intervals in hours.....	4	4	4	4	4	4	4	4

[1] Principles and Practice of Infant Feeding.

cow's milk has been established the feedings are increased. Babies heavier than the average will, of course, take larger feedings.

A simpler method of using cow's milk during the first month is to start with 5 ounces and 15 of water boiled for two or three minutes. This may be divided into the requisite number of bottles depending on the interval of feeding. As soon as this is well borne, add 1 teaspoonful of cane sugar or dextrimaltose. The milk is to be increased every other day 1 ounce and the water decreased 1 ounce, and on the alternate days the sugar increased 1 teaspoonful until 8 teaspoons are given, then increase less often until the infant is getting the amount of milk and sugar indicated by his weight and age as outlined above.

Holt and Howland have arranged the following table of whole milk mixtures. If more than 20 ounces is required the calculations are easily made. The ages are only suggestions and are not to be followed closely:

Formulas from Whole (4 per cent.) Milk

Giving Approximate Percentage Composition and Caloric Value

	I	II	III	IV	V	VI	VII	VIII	IX	X
Milk (ounces)...	6	7	8	9	10	11	12	13	14	15
Water (ounces).	14	13	12	11	10	9	7	5	1	0
Gruel [1] (ounces)	...	...	...	...	...	...	1	2	5	5
Sugar [2] (even tbsp.)..	2½	2½	2½	2½	2½	2½	2	1½	1	1
Total	20	20	20	20	20	20	20	20	20	20
Fat, per cent....	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00
Sugar, per cent..	5.70	6.00	6.00	6.50	6.50	6.50	6.00	5.50	5.50	5.00
Starch, per cent.	....	....	....	....	....	....	.40	.80	2.00	2.00
Protein, per cent.	1.00	1.20	1.40	1.60	1.75	1.90	2.10	2.25	2.40	2.60
Calories per oz...	11.5	12.5	13.5	14.5	15.5	16.5	17.0	18.0	20.0	21.0
Approx. age indication ...	2 da.	1 wk.	3 wk.	2 mo.	3 mo.	4 mo.	5 mo.	6 mo.	8 mo.	9–11 mo.

If the child does not gain in weight it may be tried on skim milk mixtures with high sugar content. This increases the protein and lessens the fat, which seems so often to be the stumbling block in bottle feeding. It also furnishes much of the energy in the most easily utilized form as well as a high percentage of salts which aid in water retention. The milk can have all the gravity cream removed, the remainder furnishing 10 calories per ounce and contains about 1 per cent. of fat. Methods of obtaining the milks of different fat percentage is given under Holt's Percentage Milk Method. Malt soup preparations are useful where the child is not gaining. Children fed on milk low in fat and protein and rich in carbohydrates are apt to develop rickets, so that it is a good plan to increase the fats to about 3 per cent. and up to 4 per cent. may be used in many cases. The top milk method given below furnishes an

[1] The gruel here indicated is made in the proportion of 1 oz. by volume to 10 oz. of water.

[2] Milk sugar is here indicated; of cane sugar use two scant tablespoonfuls instead of two and a half, and one instead of one and a half, etc. Maltose may be used in the same amounts as milk sugar.

easy, accurate method of obtaining mixtures high in fat. The objection to the high fat percentages is that fat seems to be the most difficult part of the food for the infant to digest, and hence fat indigestion is common, particularly in housed city children. Active, out door babies manage fat easily as a rule. The breast fed baby digests approximately 4 per cent. of fat and in our experience bottle fed babies on the higher percentage do better ultimately than the low percentage ones, but low fat feeding is better in infants with weak digestion and in dispensary or similar practice. In using high fat mixtures the interval of feeding may generally be lengthened to advantage.

Fat indigestion is liable to happen in infants fed on milk from Jersey, Alderney and Guernsey cows. Such milk usually contains abnormally high fat percentages and the fat droplets are large and tend to coalesce. The milk from common cows is better as the fat droplets are smaller and the percentage lower. Milk from Holstein cows is said to approach human milk more nearly as regards its fat containing more olein and less of the volatile glycerids.

In fat indigestion the baby should be put on skim milk mixtures and the fat percentage gradually increased, always keeping well inside the limit of tolerance. Another suggestion is to use skim milk to which washed butter has been added; some of the fatty acids being soluble in water are thus removed. We have had no experience with this method.

Children getting too little sugar usually are slow in gaining. If too much is given and a sugar intolerance created or if the child is unable to utilize sugar in any quantity, as many are not, especially after diarrheal disturbances, food low in sugar may be given. Omitting or lessening the sugar in many cases is sufficient. In severe cases casein or eiweiss milk may be used as a corrective (see same). It is only a temporary expedient and not suited for prolonged use. Buttermilk in these cases is often of great service.

If the protein is too low the child does not gain, or even loses. Protein indigestion or intolerance varies in degree. Many times it is only for raw milk proteins and boiling the milk relieves the condition. The addition of alkalis to prevent clotting in the stomach or to inhibit gastric digestion entirely may be tried, or whey proteins may be more largely used or the milk may be peptonized (pancreatized).

Sometimes intolerance for cow's milk exists and some other food must be used. Cases of intolerance where the infant's digestion has not been disturbed by faulty feeding are rare, but intolerance due to unfortunate methods are common. Temporary feeding with condensed milk, with or without barley or soy flour or both, is most useful. Dried milk or malted milk may be of service or malt soup preparations may be tried.

Alkalis such as lime water, etc., may generally be dispensed with, but are useful in certain cases. Fresh fruit juice, as orange juice, is a valuable adjunct to the infant's diet. Purées of green vegetables in small quantities (one-quarter to two teaspoonfuls) may also start the growth in a baby who is at a standstill.

Reports.—It is a good plan to have the mother fill out a simple blank concerning the child's condition. By doing this, part of the responsibility is placed on the mother, the physician is kept informed as to the infant's condition, and needless visits are thus obviated. Such a form from Holt is shown on page 294.

Laboratory Feeding.—In cities the best substitute for breast-feeding is furnished by milk laboratories, where modifications are made according to the physician's prescription. The Walker-Gordon Laboratories, now established in many cities, supply an ideally clean milk, unsterilized, pasteurized, or sterilized at any temperature desired. The milk is supplied in nursing bottles, each bottle holding enough for one feeding and being ready for use. Beyond warming the bottle and putting on a nipple no further preparation is necessary. In winter the milk is delivered in baskets, and in summer in small refrigerators. When economy must be practised, the milk may be obtained in larger jars and divided into the requisite number of feedings by the mother or nurse. Blank forms on which to write prescriptions are furnished physicians.

The percentage of fat, protein, and sugar required by an infant of any given age must be borne in mind if one is to use any method of percentage feeding. The following schedule will be found useful as an aid to the memory. The figures for intermediate ages are easily calculated:

Schedule for Average Infants.

Age.	Percentage.		Average quantity for one feeding.			Number of feedings 24 hours.	Interval by day.
	Fat.	Sugar.	Protein.	Ounces.	Grams.		
Premature infants	1.0	4.0	0.25	¼–¾	10–20	12–20	1–1½ hours
1st–2d day . . .	. .	5.0	. .	1–1½	30–45	4–6	6–4 "
2d–8th day . . .	2.0	6.0	0.50	1½	45	10	2 "
3d week	2.5	6.0	0.75	2	60	10	2 "
2d month . . .	3.0	6.0	1.00	3	90	9	2½ "
3d month . . .	3.0	6.5	1.25	3½	110	8	3 "
4th month . . .	3.5	7.0	1.50	4	125	7	3 "
5th month . . .	3.5	7.0	1.75	5	160	7	3 "
6th–10th month .	4.0	7.0	2.00	7	220	6	3 "
11th month . . .	4.0	5.0	2.50	8	250	5	4 "
12th month . .	4.0	5.0	3.00	9	280	5	4 "
Later . . .	4.0	4.5	3.50	9	300	5	4 "

The quantity should be increased half an ounce or an ounce at a time. Later, as the child's appetite grows stronger,—that is, when

Report of .... *Born* ....

Address ....

Weight .... *Gain or loss since last report* ....

Stools, number .... *Color* ....

Consistence ....

Vomiting or regurgitation ....

When ....

How much ....

Flatulence or colic ....

Appetite .... *Does the child seem satisfied?* ....

Does the child leave any of its food? ....

Is the child comfortable and good-natured? ....

How much does the child sleep? ....

Remarks ....

....

Date of this report .... *Date of last report* ....

he seems dissatisfied after his bottle,—the quality is raised. The fat may usually be increased 0.5 per cent. at a time; the sugar, 0.5 to 1 per cent. at a time; the proteins, from 0.1 to 0.25 per cent. at a time. Strong, healthy, large babies require more and richer milk than those of frailer constitution.

What is known as nursery milk is also supplied. This is from a selected herd of cattle whose milk contains the fat in very small globules. This is said to be more easily digested, especially by weak infants.

In the fifth edition of this work will be found details of another percentage method, and also his top milk method, should any care to pursue this subject further.

Materna Graduate Method.—The very simple and useful apparatus known as the Estraus Materna Graduate is of great value where one cannot secure intelligent coöperation in the home, and also where there are no facilities for milk preparation. This method of infant feeding has been tried by the authors for several years in the Robert Garrett Free Hospital for Children, Baltimore, and too much cannot be said regarding its simplicity and efficiency. With its six formulas, however, it is not adaptable to all cases, some infants being totally incapable of taking the step from one formula to another.

The apparatus consists of a glass jar with a lip and seven panels, and a capacity of 16 ounces. One of the panels exhibits an ordinary ounce graduation; the other six panels present six different formulas for the modification of cows' milk, each formula being so arranged as to keep pace with the infant's growth, viz.:

Fat	2 per cent.	2½ per cent.	3 per cent.	3½ per cent.	4 per cent.	3½ per cent.
Sugar	6 "	6 "	6 "	7 "	7 "	3½ "
Protein	0.6 "	0.8 "	1 "	1½ "	2 "	2½ "

For Formula 6 see special instructions below.

	3d to 14th day.	2d to 6th week.	6th to 11th week.	11th week to 5th month.	5th to 9th month.		9th to 12th month.
Milk . . . . parts	1¼	1⅝	2	4½	6	Milk . . . . parts	9¾
Cream . . . "	1¼	1⅝	2	2	2	Cream . . . "	1
Lime-water "	1	1	¾	¾	¾	Barley-gruel "	5¼
Water . . . "	12½	11¾	11¼	8¾	7½	Granulated sugar, parts	¼
Milk-sugar "	1	1	1	1	1¼		

Having decided which formula is to be used, the panel containing that formula is the only one to be followed.

The quantity desired for twenty-four hours is next to be considered, and the apparatus filled—once, if 16 ounces or less are required for the twenty-four hours; twice, if from 16 to 32 ounces are required for the twenty-four hours; three times, if from 32 to 48 ounces are required for the twenty-four hours.

Directions.

(The lines beneath the words indicate the points to which the various ingredients are to be filled in.)

1. *Milk-sugar.*—Introduce milk-sugar to the line so marked. Where good milk-sugar can not be obtained, granulated sugar, in just half the quantity, should be used. A small cross on the apparatus indicates this point. (See directions for Formula 7.)

2. *Water.*—Add boiled water (hot) to the water-mark, and stir until the sugar is dissolved. If any particles are seen floating in the solution, it should be filtered either through absorbent cotton or through two thicknesses of clean muslin.

3. *Lime-water.*—Ordinary lime-water, such as is obtained at drug-stores, should then be filled to the L-water mark.

4. *Cream.*—This should be the ordinary cream (16–20 per cent.) as obtained in bottled milk; it should be poured in to the cream mark. If the cream is purchased separately, ordinary cream, and not centrifugal cream should be used.

5. *Milk.*—Ordinary good cows' milk should be used and the jar filled to the milk mark.

6. The entire mixture should next be stirred.

7. The whole should then be poured into separate bottles and sterilized if desired, or stoppered with cotton and immediately placed upon ice.

Directions for formula 6.—1. Sugar.—In this formula granulated sugar should be used in place of milk-sugar, and the sugar introduced into the vessel to the line thus marked.

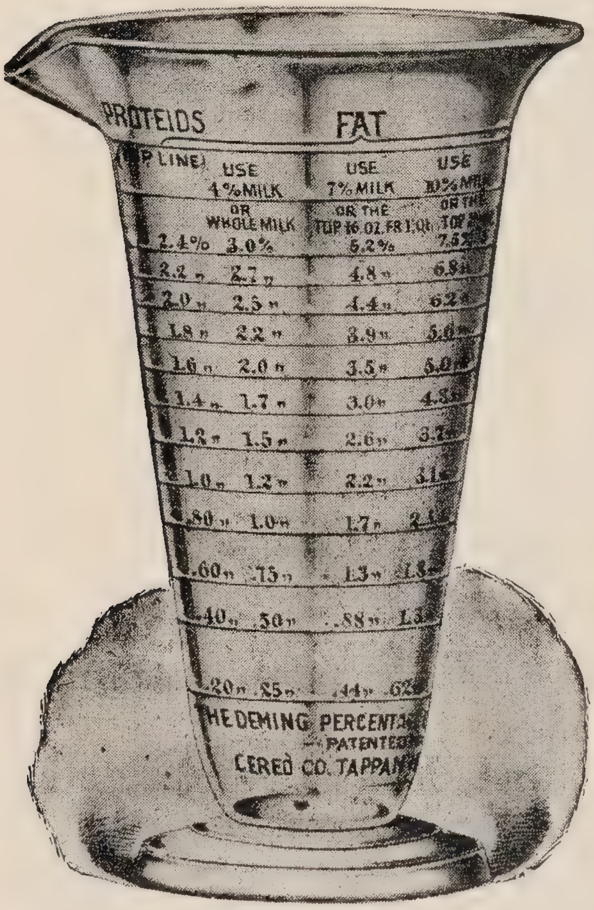

Fig. 2.—Deming's milk modifier.

2. *Barley-gruel.*—In this formula barley-gruel should be used instead of water, and the glass filled to the line thus marked. Barley-gruel should be prepared as follows: To 1 tablespoonful of pearl barley, after soaking for several hours, add 1 pint of water, a pinch of salt, and boil for five or six hours, adding water as necessary. Strain through muslin. Or the following method may be used: 1 rounded tablespoonful of any good barley flour; rub up with cold water, and add to 1 pint of boiling water; cook for fifteen minutes, stir, and strain if lumpy.

3. *Cream.* 4. *Milk.*—Add the same as in other formulas.

5. *Stir.* 6. *Sterilize.*—Same as in other formulas.

The Deming Modifier.—Another ingenious graduate for obtaining percentages is called the Deming modifier, which has on it the following markings:

Graduations and Markings.

Proteins.	Fat.					
(Top line).	Use 4% milk or whole milk.	Use 5% milk or the top 24 ounces from 1 quart.	Use 6% milk or the top 20 ounces from 1 quart.	Use 7% milk or the top 16 ounces from 1 quart.	Use 10% milk or the top 11 ounces from 1 quart.	Use 12% milk or the top 9 ounces from 1 quart.
Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.
—— 2.8	3.5	4.4	5.2	6.0	8.6	10.4
—— 2.6	3.2	4.0	4.8	5.6	8.0	9.7
—— 2.4	3.0	3.7	4.5	5.2	7.5	9.0
—— 2.2	2.7	3.4	4.0	4.8	6.8	8.2
—— 2.0	2.5	3.0	3.7	4.4	6.2	7.5
—— 1.8	2.2	2.8	3.3	3.9	5.6	6.7
—— 1.6	2.0	2.5	3.0	3.5	5.0	6.0
—— 1.4	1.7	2.2	2.6	3.0	4.3	5.2
—— 1.2	1.5	1.8	2.2	2.6	3.7	4.5
—— 1.0	1.2	1.5	1.8	2.2	3.1	3.7
—— .80	1.0	1.2	1.5	1.7	2.5	3.0
—— .60	.75	.95	1.1	1.3	1.8	2.2
—— .40	.50	.62	.75	.88	1.3	1.5
—— .20	.25	.30	.38	.44	.62	.75

Directions.—Pour whole milk or top milk up to desired percentage of proteins. Then add gruel or water to top line. This makes 16 ounces. The top milks are to be removed from 1 quart of milk after the cream has risen.

1 level tablespoonful of granulated sugar = 2½ per cent.
2 level tablespoonfuls of granulated sugar = 5 per cent.
1½ level tablespoonfuls of milk-sugar = 2½ per cent.
3 level tablespoonfuls of milk-sugar = 5 per cent.

To add 5 per cent. of lime-water leave out 1 ounce of gruel or water and replace with lime-water. To make 8 ounces, pour milk up to one-half desired percentage of protein and add gruel or water to 8-ounce lime. Use one-half quantity of sugar.

To ascertain what milk to use to obtain any desired combination of protein and fat, pick out the desired percentage of proteins in the protein column. Then move in a horizontal line to the right until the desired percentage of fat is found. The heading of the fat column shows what milk to use. The percentage of sugar in the diluted milk is almost exactly the same as the percentage of protein.

Baner's Method.—Many attempts have been made from time to time to compute a table of equations from which the quantities of milk, cream, etc., may be determined for any given mixture; the simplest of these is that of Baner: [1]

[1] New York Medical Journal, March 12, 1898.

Quantity desired (in ounces) $= Q$.
Desired percentage of fat $= F$.
Desired percentage of sugar $= S$.
Desired percentage of protein $= P$.

To find in ounces—

Cream (16 per cent.) $= \frac{Q}{12} \times (F - P)$.

Milk $= \frac{Q \times P}{4} - C$.

Water $= Q - (C + M)$.

Dry milk-sugar $= \frac{(S - P) \times Q}{100}$.

Example.—Suppose it is desired to make 40 ounces of a 4 per cent. fat, 7 per cent. sugar, 2 per cent. protein mixture. By substituting the figures in the equations above we have—

Cream $= \frac{40}{12} \times 2 = 6\frac{2}{3}$ ounces.

Milk $= \frac{40 \times 2}{4} - 6\frac{2}{3} = 13\frac{1}{3}$ ounces.

Water $= 40 - 20 = 20$ ounces.

Sugar $= \frac{5 \times 40}{100} = 2$ ounces.

Technic of Modifying Milk at Home.—To insure success in home modification a very careful technic must be followed by the mother or the nurse. In the absence of a nurse specially trained for the purpose it becomes necessary for the physician to give careful written and verbal instructions, and then to see personally that these are carried out. Knowledge on the part of the mother or nurse should not be assumed, for, as a rule, she does not possess it. There are many nurses, both graduate and otherwise, whose conceptions of infant feeding and milk preparation are practically useless. Like many medical students and recent graduates, they understand more about laparotomies than they do about milk. If this is borne in mind, many unpleasant experiences may be avoided.

The vessels and instruments used should be kept scrupulously clean, and be used solely for the purpose intended. After use, or, what is decidedly better, just previous to being used, they should be either boiled or scalded with boiling water, preferably the former.

The nursing-bottles should have rounded bottoms, so that there are no corners for holding dirt, and also that they can not be stood about the room. If only one or two bottles are used, they should be scalded after each feeding and filled either with boric acid or sodium bicarbonate solution, made by adding a teaspoonful of either drug to a pint of water. When the bottle is to be used again, the solution should be poured out and the bottle rinsed with plain sterile water.

The nipples should be of the ordinary short black-rubber variety. White nipples, which are said to contain lead, as well as all com-

plicated nipples and tubes, should be avoided. These latter can not be kept clean, and are a source of infection in diarrhea. In some cities their sale is prohibited by law. After each feeding the nipple should be washed, turning it inside out to do this thoroughly, and then placed in a glass of boric acid solution (ʒj : Oj). It is a good plan to have several nipples on hand and to boil them before using them for the first time, and then for five minutes every day. The hole or holes in the nipple should be just large enough to allow the milk to drop out somewhat rapidly. It should not flow out in a stream. If the holes are too small, they may be enlarged or new ones made by using a red hot darning-needle. Some nipples are made without holes, and these may be perforated in the same manner. When several holes are so made in a nipple, the milk may not drop very fast, but the food reaches the child rapidly enough, a fact that may easily be demonstrated if the nipple is grasped between the fingers and sucking movements imitated.

Preparation.—It is best to prepare the entire quantity for twenty-four hours at one time. If the weather is warm, the milk must be Pasteurized or sterilized immediately (see section on Milk) unless the weather is cold and a clean milk can be obtained.

If the top-milk method is used, the milk should be received in bottles. In all cities there are reliable dairies that supply milk in bottles. Where this is not the case, the bottles should be furnished the milkman, and arrangements can generally be made by which the milk will be poured into them as soon as possible after milking. After the milk has stood for at least five hours, the first ounce of cream may be removed with a spoon and the remainder of the upper one-third or one-half, as the case may be, with a Chapin milk-dipper. Another method is to use a bent glass tube and siphon off the lower part of the milk from the bottom of the bottle, or the top-milk may be poured off with reasonable accuracy.

The physician should always write out the quantities to be used for preparing the milk. The milk- or cane-sugar is dissolved in hot water. Care should be taken to use a sugar that gives a clear solution without filtering. If the solution is not clear, however, it should be filtered through a wad of cotton placed in the bottom of a funnel or through a piece of druggist's filter-paper. This solution, together with the lime-water or sodium bicarbonate, should be poured into a pitcher. Into this the milk, or milk and cream, should be poured, and the remainder of the water added. The water should always be boiled. The mixture should then be stirred and poured into the nursing-bottles. The bottles should then be stoppered with moderately tight plugs of non-absorbent cotton, to keep out bacteria. The bottles are then Pasteurized or sterilized and placed in a refrigerator.

At the feeding hour the bottle is taken out of the refrigerator, placed in a pitcher or tall vessel of hot water to warm it, the cotton

plug removed, and a nipple substituted. The milk should be heated until it is lukewarm—about 98°-99° F. The nipple should never be placed in the mouth to test the heat, but the milk may be allowed to drop on the wrist, where it should feel warm, but not hot.

OTHER FOODS FOR INFANTS

The following foods may be of service in some conditions and may be briefly considered:

Goat's Milk.—This is used some in infant feeding. It may be given in place of cow's milk in any child, but its chief use is in children who are sensitized to cow's milk and become ill on taking it. The fat globules are small and this renders it more digestible. Ordinarily no cream rises on goat's milk. The casein forms hard, tough curds. The composition resembles cow's milk.

Bosworth and Van Slyke[1] give the composition of goat's milk and comment as follows:

Compounds in Cow's Milk, Goat's Milk and Human Milk.

Compounds.	Cow's milk.	Goat's milk.	Human milk.
Fat	3.90	3.80	3.30
Milk sugar	4.90	4.50	6.50
Proteins combined with calcium	3.20	3.10	1.50
Salts	0.901	0.939	0.313
Dicalcium phosphate	0.175	0.092	0.000
Tricalcium phosphate	0.000	0.062	0.000
Monomagnesium phosphate	0.103	0.000	0.027
Dimagnesium phosphate	0.000	0.068	0.000
Trimagnesium phosphate	0.000	0.024	0.000
Monopotassium phosphate	0.000	0.073	0.069
Dipotassium phosphate	0.230	0.000	0.000
Potassium citrate	0.052	0.250	0.103
Sodium citrate	0.222	0.000	0.055
Potassium chloride	0.000	0.160	0.000
Sodium chloride	0.000	0.095	0.000
Calcium chloride	0.119	0.115	0.059

In the preceding table the figures which have special interest are those relating to the salts, and we notice the following points in relation to these compounds:

(1) **Phosphates.**— (*a*) *Cow's Milk.*—The insoluble phosphate is dicalcium phosphate; tricalcium and trimagnesium phosphates are not present. The soluble phosphates are monomagnesium and dipotassium, and they constitute about two-thirds of the total phosphates.

(*b*) *Goat's Milk.*—This differs from cow's milk (1) in containing tricalcium, dimagnesium, trimagnesium, and monopotassium phosphates, which are absent from cow's milk, and (2) in containing no

[1] Technical Bulletin 46, December, 1915, N. Y. Agricultural Experiment Station.

monomagnesium or dipotassium phosphates, which are present in cow's milk.

(*c*) *Human Milk* differs very noticeably from both cow's milk and goat's milk in containing no insoluble phosphates, but only the soluble compounds, monomagnesium and monopotassium phosphates. The phosphates in human milk are much less in amount than in cow's or goat's milk.

(2) **Citrates.**—All three milks contain potassium citrate, while cow's milk and human milk contain sodium citrate also, but goat's milk does not.

(3) **Chlorides** are present in goat's milk in much larger amounts than in cow's milk or human milk; the amount in cow's milk is considerably larger than in human milk. In cow's milk and human milk the chloride appears to be calcium chloride, while in goat's milk potassium and sodium chlorides are also present.

(4) The total amount of **salts** in human milk is about one-third that in cow's or goat's milk. The number of different salts appears to be greatest in goat's milk and least in human milk.

Owing to the difficulty of getting fresh goat's milk, evaporated goat's milk may be used. Various producers have placed this on the market. That made by the Widemann Goat Milk Laboratory of San Francisco is said to have the following composition:

Fat	8.50
Sugar	9.00
Protein	7.30

This is usually diluted one-third evaporated milk and two-thirds water,

Fat	2.60
Sugar	3.00
Protein	2.40

or one-quarter evaporated milk with three-quarters water,

Fat	2.10
Sugar	2.20
Protein	1.80

Sugar may be added to increase the fuel value, usually 4 or 5 per cent.

Goats are rarely affected with tuberculosis, which makes the milk safe with regard to this disease, but they are liable to infection with Bacillus melitensis, which does not seem to hurt the goat, but through the milk it may cause Mediterranean fever in human beings. Fortunately this form of infection is rare in America.

In hot countries the goats are driven from door to door and milked where the milk is sold.

Further information may be found in "Milk Goats," U. S. Dept. Agriculture, Farmer's Bulletin 920, and "Goats' Milk for Infant Feeding," Jordan and Smith, Bulletin 429, February, 1917, N. Y. Agricultural Experiment Station.

Condensed Milk.—This is most useful in many cases as a temporary expedient. It may be used to great advantage in certain difficult cases, especially those which have been improperly fed on too high fat and protein mixtures. It is also useful at times in infants who are not gaining, and when the failure to gain is the only symptom. As a temporary feeding when pure milk cannot be obtained, as in traveling, it may be used to advantage.

We generally use it in dilutions of 1 in 16, 1 in 12, or 1 in 8—occasionally as high as 1 in 6. It should be measured in a measuring glass, otherwise too much will be used. It may be diluted with plain boiled water or, if desired, with a thin cereal gruel.

Cream may be added later or olive oil may be given in addition. Orange-juice should always be given every other day or every day as an antiscorbutic. If condensed milk feeding is continued too long, anemia, scurvey, or rickets is liable to develop, if not that, the child becomes large and flabby, but with small bones and muscles and but little resistance to infections.

Condensed milk furnishes about 100 calories per ounce. In the dilutions as ordinarily used it contains the following percentages:

	1 in 6. rarely used.	1 in 8.	1 in 12.	1 in 16.
Fat	1.66	1.25	0.83	0.62
Protein	1.50	1.12	0.75	0.56
Sugar	8.83	6.63	4.41	3.31
Calories per ounce approximate	17.00	12.8	8.5	6.4

Buttermilk.—For many years buttermilk has been used in Holland for infant feeding, and of recent years it has been extensively used in various countries. It has several advantages, chief of which are that it contains a low fat- and sugar-content and also lactic-acid bacilli in larger numbers. The curd of the milk is precipitated in small flakes. It is easily digested by most infants and may be diluted with water or cereal gruels as desired. Sugar may be added, if desired, as to any milk mixtures. In cases where the digestive faculties have been impaired by feeding mixtures containing too much fat it seems to be of especial value. It is also very useful in diarrheal affections, especially those in which abnormal bacteria have found their way into the intestine. The lactic-acid bacilli drives out most of the other intestinal bacteria. In intestinal indigestion it is often of great value.

The buttermilk is best kept and the mixtures made just before they are used.

Acid Milks.—These are extensively used, and are whole milk, to which various strains of lactic-acid bacilli have been added. These milks are sold under various names, and often other food substances are incorporated. Such acid milk contains fat in the proportion as ordinarily found in cows' milk, and in some cases may not be as

desirable as buttermilk. In other cases where a very nutritious food is needed they are of great value. In intestinal indigestion acid milk is particularly useful, and it is also of service in the convalescence from diarrheal diseases. It should be diluted to meet the individual case. It is a good plan to start with rather weak mixtures.

Kumiss and other fermented milks are sometimes of use in very difficult cases.

Hydrochloric Acid Milk.—Faber has suggested the addition of hydrochloric acid to cow's milk to render it more digestible. He uses a tenth-normal acid which contains about one-twenty-seventh the amount of hydrochloric acid as in dilute hydrochloric acid U. S. P. The formula prescribed is made up and the acid added last when the milk is cold, and after it has been added the milk should not be heated above 100° F., lest it curdle. The acid is poured in gradually while the milk is stirred with a glass rod. The amount of acid added is calculated on the amount of milk used, not the total volume; ordinarily about one-fourth the amount of tenth-normal hydrochloric acid is added. When there is diarrhea, sugar should not be added until the stools have been normal for several days. The fats are usually well borne, and after a few days use of whole milk in the formula top milks may be used, and sometimes normal stools do not result until this is done. Acid milks should not be used under six weeks of age. The hydrochloric acid is not metabolized, but is neutralized and excreted. We are inclined to question the prolonged use of such milks. Gamble suggests HCl milk in tetany.

An Old Dutch Method.—Raw milk with the cream left in is generally used, although some or all of the cream may be removed to advantage in severe diarrhea. It is very important that the milk be unheated. The milk is placed in a bowl and is allowed to stand for twenty-four hours or until it is like junket. It is then churned for five minutes. One heaping tablespoonful of granulated sugar and flour each are mixed with a little of the churned milk. Then the rest of the milk is added and boiled for five or ten minutes, being stirred constantly. If in the cooking it appears to be separating, a little more flour is added. This milk is kept at a room temperature, not in a refrigerator, and should be made two or three times a week. It is given at room temperature without heating. The first feedings should be small and diluted with water, and after the first day or two the full strength milk may be used. This milk has been used with remarkable success by H. L. K. Shaw in St. Margaret's House, Albany, but he states that results in private practice have not been so satisfactory.

Albumin Milk.—This is a mixture suggested by Finkelstein under the name of Eiweiss Milch, and has also been called protein milk. This food is prepared as follows: Heat one quart of whole milk to

100° F., add four teaspoonfuls of essence of pepsin, and stir. Then let the mixture stand at 100° F. until the curd has formed. Put the mass in a linen cloth and strain the whey from the curd. Remove the curd from the cloth and press it through a fine sieve two or three times, using a wooden mallet or spoon. While doing this one pint of water should be added. The precipitate should be very finely divided and the mixture should look like milk. To this one pint of buttermilk is added. The buttermilk contains little sugar and has the advantage of containing lactic acid. The composition of albumin milk is as follows:

Fat	2.5	per cent.
Protein	3.0	"
Sugar	1.5	"
Salts	0.5	"

One liter or quart furnishes about 370 calories. To obtain good results from this milk it must be used in a certain way. In the beginning it must not be mixed with any other form of food, not even human milk. The infant should be starved or given a "tea diet." Small amounts of albumin milk are given, and if all goes well, larger and larger amounts. The green, loose, bad stools should quickly change to soap stools, and then some form of carbohydrate should be added to increase the caloric value of the food. Malt sugar is usually added, beginning with 1 per cent., which is sometimes added from the beginning. Some of the mixtures of maltose and dextrin may be used instead.

There is an initial loss of weight, owing to the low caloric value of the food, then a stationary weight, and when the carbohydrate is added there should be a gain. Too long a period should not elapse between beginning the milk and adding the carbohydrate. The dextri-maltose may be added up to 5 per cent., and if there is no gain, 2 per cent. of some cereal flour may be added.

Albumin milk is a very valuable addition to the armamentarium of the pediatrician. It is difficult to make, and for this reason cannot always be used in the cases where it would do the most good. A full account by Hess will be found in the American Journal of the Diseases of Children, December, 1911, vol. ii., p. 422.

For those who cannot afford casein milk Reuben suggests the following: Add two junket tablets to a pint of milk. After standing for one-half hour strain, discard the whey and rub the curd through a fine sieve together with a pint of milk and then add enough plain boiled water to make one quart. The whole mixture is then brought to a boil with constant stirring and is then ready for use. This has nearly the value of casein, but lacks the acidity, a point which does not seem to be essential.

Albumin milk furnishes a food high in protein, but apparently this does not harm the infant during the short period that it is

taken, but helps make up the previous loss. The caloric value is low and there may be a loss of weight, but not at the expense of the body protein. The total acidity, the volatile and fatty acids of the stools are decreased and the amount of water lost through the bowel is lessened while mineral salts are retained better. There is an increase in the formation of soap with a tendency to fewer and less irritating movements. The food should only be used for short periods as a corrective of digestion or nutritional disturbances.

It is indicated in diarrheal diseases and indigestion and various forms of nutritional disturbances, as marasmus, and where the tolerance for sugar, fat, or salts has been disturbed.

Powdered protein milk has been made by various manufacturers. This simplifies the problem, but it is exceedingly important to remember that these milks are perishable and should be obtained only through sources known to supply the fresh preparation.

Calcium Caseinate Preparations.—These are easy to prepare and may be used in place of casein milk, particularly in fermentative diarrheas and also in the other indications. They are on the market under various trade names, such as Casec and Larosan and Protelac. These are usually used in proportions of ⅔ ounce to 1 quart of the finished mixture. The directions vary slightly, but calcium caseinate should be mixed with 3 or 4 ounces of cold milk until dissolved; then add the balance of the milk and boil five minutes, add whatever water is to be used, and bring to a boil. The water may be added before cooking if desired. Some advise mixing the calcium caseinate in a small amount of the mixture and bringing the remainder to a boil, then adding the cold solution to the hot, constantly stirring, as in making a custard. It has a tendency to lump, and if this results, the lumps may be strained out. It is very important in diarrheas to use very small feedings at first, increasing as in casein milk, and adding dextrimaltose or cereals in the same way. The strength of the mixtures may be varied to suit the individual case, one-half skimmed milk or two-thirds skimmed milk, or a mixture can be made up entirely of skimmed milk.

Undiluted Citrated Milk.—In dispensary and similar practice H. Corry Mann suggests and has used successfully such mixtures. The required amount of sodium citrate is given in solution so that a teaspoonful may be added to the feeding *just before it is given.* Two grains are added for each ounce of milk up to 8 grains, and this amount is generally sufficient for the larger feedings, and if it is not, 5 grains each of sodium citrate and potassium citrate are used, the latter to prevent sodium retention. Sometimes smaller amounts than those stated are sufficient. The milk is citrated until the baby can take whole milk satisfactorily without it, generally at about the tenth month, but sometimes the milk is citrated up to the eighteenth month. Extra carbohydrate in the form of malt extract is given to most

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children over two months of age. Some infants show an intolerance for it. The malt extract is not added to the milk, but dissolved in water and given between feedings in two or three portions. This is done so that in case of vomiting or diarrhea it can be eliminated without changing the food. Mann gives the following suggestions as to the feedings:

These are the quantities of milk which are used for out-patients; the figures which are given may be taken as a *good working guide for the great majority of cases.* In sime instances, if the child is ill or some form of dyspepsia is already present, slightly smaller quantities may be indicated for a week or two, but a return will very soon be made to standard totals:

(*a*) Baby, seven days old, weight 8 pounds.
Feeds nine per diem, 2 ounces each.
Total whole milk, 18 ounces—360 calories.
(1 ounce milk, 3.5 per cent. fat—20 calories),
or 45 calories per pound.

(*b*) Baby, fourteen days old, weight 8 to 8½ pounds.
Feeds as above,
or 45 calories per pound.

(*c*) Baby, one month old, weight 9 pounds.
Feeds 9 per diem, 2½ ounces each.
Total whole milk, 22½ ounces—450 calories,
or 50 calories per pound.

(*d*) Baby, two months old, weight 10 pounds.
Feeds eight per diem, 3 ounces each.
Total whole milk, 24 ounces—480 calories.
In addition:
Malt extract 1 teaspoonful dissolved in ½ ounce of warm milk (not given with milk feeds)—30 calories containing 90 grains maltose.
Total, 510 calories, or 51 calories per pound.

(*e*) Baby, three months old, weight 11 pounds.
Feeds eight per diem, 3½ ounces each.
Total milk, 28 ounces—560 calories.
Malt extract as above—30 calories.
Total, 590 calories, or 53 calories per pound.

(*f*) Baby, four months old, weight 12 pounds.
Feeds seven per diem, 4 ounces each.
Total milk, 28 ounces—560 calories.
Malt extract, 1½ teaspoonfuls in ½ ounce of warm milk (containing 135 grains maltose)—40 calories.
Total, 600 calories, or 50 calories per pound.

(*g*) Baby, six months old, weight 14½ pounds.
Feeds seven per diem, 5 ounces each.
Total milk, 35 ounces—700 calories.
Malt extract as above, 40 calories.
Total, 740 calories, or 50 calories per pound.

(*h*) Baby, eight months old, weight 17 pounds.
Feeds six per diem, 6 ounces each.
Total milk, 36 ounces—720 calories.
Malt extract, 2 teaspoonfuls in ¾ ounce of warm milk—55 calories (containing 180 grains maltose).
Total, 775 calories, or 45 calories per pound.

(*i*) Baby, ten months old, weight 19 pounds.
Feeds five per diem, 7 ounces each.
Total milk, 35 ounces—700 calories.
Malt extract, 3 teaspoonfuls in 1 ounce of warm milk—80 calories (containing 270 grains maltose).
Total, 780 calories, or 41 calories per pound.

Dried Milk.—There are two different kinds of dried milks, one made by the Hatmaker process, where the milk is passed rapidly over heated cylinders and scraped off, and the other by the Merrell-Gere process, where the milk is sprayed through small openings into chambers where heated air is passed through. The manufacturers both claim advantages for each method. These milks are useful in infants of weak digestion, and especially when accompanied with ability to obtain but small quantities. They are also used in traveling, after digestive disturbances, and during convalescence. They are useful where pure cow's milk cannot be obtained and particularly in the tropics.

Hatmaker Process Milks.—These are marketed under various names in different countries. In America Dryco and Mammala represent this type of milk. These milks are to be dissolved in boiled water.

Dryco has an approximate analysis as follows:

Fat	12	per cent.
Lactose	44	"
Protein	34	"
Salts	7	"
Moisture	3	"
	100	"

1 ounce by weight—127 calories.
8 level tablespoonfuls (leveled with a knife)—1 ounce by weight.
1 level tablespoonful (leveled with a knife)—16 calories.

Following is the schedule suggested by the makers:

When first beginning Dryco use 1 to 2 tablespoonfuls less than the required amount. When this is taken readily *increase gradually* (½ to 1 tablespoonful at a time) until the required amount is taken.

A simpler method, doing away with the table, is to figure out the caloric needs of the baby. It is a good plan to add either sugar or dextrimaltose to the feeding except where the bowels are loose or following diarrhea. The simplest general rule is to give 2½ level tablespoonsful per day for each pound of the infant's weight, usually dissolving 1 level tablespoonful in 1 ounce of water. Another simple rule is to use 1 tablespoonful less than the number of ounces of water in the feeding until the baby weighs 16 pounds, when a level tablespoonful to each ounce may be used.

It is a good plan to give the baby either orange juice or canned tomato juice, and, if indicated, small amounts of either plain or phosphorized cod-liver oil may also be used.

Mammala.—This may be used the same way as Dryco. It has the same caloric value and its approximate composition is said to be:

Protein	24	per cent.
Butter fat	12	"
Milk sugar	54	"
Milk salts	5	"
Moisture	5	"
	100	"

Age of infant.	Weight, pounds.	Level tablespoonfuls of Dryco.	Ounces of water.	Number of feedings in twenty-four hours.
1st week......	6-8	½	2	7
2d "	6-8	1	2	7
3d "	6-8	2	3	7
1st month.....	7	3	3½	7
1st "	8	3	3½	7
1st "	9	3½	4	7
2d "	8	3½	4	7
2d "	9	4	4½	7
2d "	10	4	4½	7
3d "	10	4	4½	7
3d "	11	4½	5½	7
3d "	12	4½-5	5½	7
4th "	12	6	6	6
4th "	13	6	6	6
4th "	14	6½	6½	6
5th "	13	6½	6½	6
5th "	14	7	7	6
5th "	15	7	7	6
6th "	14	7	7	6
6th "	15	7	7	6
6th "	16	7½	7½	6
7th[1] "	15	8	8	5
7th "	16	8	8	5
7th "	17	8	8	5

The label contains the following suggestions as to quantities, but it may be given in larger feedings at longer intervals as suggested below:

PERIOD.	Grams of MAMMALA per Feeding.	Cubic centimetres of Warm Water per Feeding.	No. of heaping teaspoonfuls of MAMMALA per Feeding.	No. of teaspoonfuls of Warm Water per Feeding.	No. of Feedings per day.	Total Quantity of MAMMALA per day.
Day of birth	—	20	—	4	2	—
2nd day	5	30	1	6	8	40 Grams
3d day	7	42	1½	9	8	56 "
4th day	8	48	1½	10	8	64 "
5th day	9	54	2	11	8	72 "
While the baby's weight is less than 7 pounds..	11	66	2	13	8	88 "
While the baby's weight is between:						
7 and 8 pounds	12	72	2½	14	8	96 "
8 " 9 "	13	78	2½	15	8	104 "
9 " 10 "	15	90	3	18	8	120 "
10 " 11 "	17	102	3½	20	8	136 "
11 " 12 "	19	114	4	23	8	152 "
12 " 13 "	24	144	5	29	7	168 "
13 " 14 "	25	150	5	30	7	175 "

[1] After the baby has reached seven months of age the whole reconstituted milk may be given, *i. e.*, 8 level tablespoonfuls of Dryco in 8 ounces of water. The additional calories are obtained by adding such foods as cereals, dry bread, zwieback, and steamed vegetables.

PERIOD.	Grams of MAMMALA per Feeding.	Cubic centimetres of Warm Water per Feeding.	No. of heaping teaspoonfuls of MAMMALA per Feeding.	No. of teaspoonfuls of Warm Water per Feeding.	No. of Feedings per day.	Total Quantity of MAMMALA per day.
14 " 15 "	26	150	5	30	7	182 "
15 " 16 "	27	150	5½	30	7	189 "
16 " 17 "	32	160	6	32	6	192 "
17 " 18 "	33	165	6½	33	6	198 "
18 " 20 "	35	175	7	35	6	210 "
20 " 22 "	37	185	7½	37	6	222 "
22 " 24 "	40	200	8	40	6	240 "
24 " 26 "	50	250	10	50	5	250 "

The Merrell-Soule Milk—Klim.—This is made by the Merrell-Gere Spray Process. The milk is first pasteurized by the holding process and partially concentrated by the vacuum. It is then sprayed under heavy pressure into a chamber through which a current of filtered warm air is passing. The milk is broken up into a very fine spray and falls to the bottom as a dry powder, containing less than 3 per cent. moisture.

The claims made for this process are that the fat globules are broken up into a small size; casein curdles in finer and softer floccules; that when reliquefied it remains uniform, there being no tendency of the butter fat to rise.

It is made in three strengths—whole milk, skimmed milk, and half-skimmed milk; 4 level tablespoons equal 1 ounce. The following shows the percentage composition of the various mixtures:

	Powdered whole milk.	Whole milk restored. 4½ ounces per qt. water.	Powdered skimmed milk.	Skimmed milk restored, 3½ ounces per qt. water.	Powdered half-skimmed milk.	Half-skimmed restored, 4 ounces per qt. water.
Butterfat ...	28.00	3.33	1.35	.13	14.68	1.57
Casein	21.28	2.53	29.79	2.86	25.53	2.74
Albumin	5.46	.65	7.91	.75	6.68	.72
Milk-sugar ..	38.00	4.53	49.94	4.75	43.97	4.71
Ash	5.76	.69	8.21	.78	6.99	.75
Water	1.50	88.27	2.80	90.73	2.15	89.51
	100.00	100.00	100.00	100.00	100.00	100.00
Calories per ounce	149	18.0	106	10.1	128	13.7

Half-skimmed powder is made by mixing equal quantities of whole and skimmed powder.

The following are suggestions made by the makers regarding its use in infant feeding:

While klim will dissolve in cold water, warm water is recommended because the solubility of the milk-sugar is thereby promoted.

Age.	Klim, whole, level tablespoons.	Milk-sugar, level teaspoons.	Water, ounces.	Number of feedings per day.	Calories per day.
1st week	¼	¾	2	7	132
2d, 3d, 4th weeks	½	1	3	7	216
2d month	1	1½	4	7	401
3d month	1½	1¾	5	7	547
4th month	2	2	5½	6	609
5th and 6th months	2½	1½	6½	6	674
7th month	3	½	7	6	710
8th month	3¾	½	8	5	732

S. M. A.—Gerstenberger, of Cleveland, has worked out a formula of a milk sold under the name of S. M. A. When properly diluted the milk is approximately the composition of human milk, but the manufacturers give the following analysis:

Chemical and Physical Analysis of S. M. A. When Ready to Use

Caloric value per 100 c. c.	68.0
Caloric value per ounce	20.0
Protein	1.2–1.3
Fat	3.5–3.6
Carbohydrate	7.2–7.5
Ash	0.25–0.30

The advantages claimed for this mixture are that it is not necessary in healthy babies to make any change in its composition from early infancy on, the fats in the cow's milk having been replaced with a combination of the various animal and vegetable fats closely resembling the fats in human milk as shown by various tests that the use of the milk is not accompanied by the development of rickets, spasmophilia, or anemia in full-term normal infants.

The milk includes a certain amount of cod-liver oil, and when it is used it is urged that babies be given orange juice or tomato juice from the first of life on. This food is not recommended in children whose nutrition has been disturbed by improper feeding, nor should S. M. A. be used in babies with diarrhea. Babies weighing less than 5½ pounds (2500 grams) should be given a mixture of one-half boiled skimmed milk and one-half prepared S. M. A. Infants weighing between 5½ to 7½ pounds (2500 to 3500 grams) should be given one-third boiled skimmed milk and two-thirds prepared S. M. A. In some instances where the appetite is poor S. M. A. may be given in more concentrated form, double or one and one-half strength. In such children water should be offered from two to four times a day.

The S. M. A. is made in powder and concentrated liquid form. To prepare the concentrated liquid form pour the contents of one large can, approximately 1 pint, into a clean boiled bottle or 32-ounce graduate. Fill the bottle to the top or the graduate to the 32-ounce mark, with a clear cold water and mix well. This should be put in the feeding bottle and kept like milk until feeding time. The regular strength of the S. M. A. may also be prepared by mixing 4½ parts of concentrated liquid S. M. A. with 5½ parts of boiled water. To

prepare the S. M. A. from the powder form small measuring cups are supplied, sufficient to make 2 ounces and 3 ounces of the mixture. Make 2 ounces fill the 2-ounce S. M. A. measuring cup, empty its contents into a clean pitcher or cup, gradually add enough of 2 ounces of warm, boiled water to make a smooth paste, and then add the rest of the 2 ounces, stirring well. For 3 ounces use the 3-ounce measuring cup in the same manner. To make larger feedings combinations of the 2- and 3-ounce cups should be used. The powder may also be weighed out using 1 ounce of the powder by weight and 7 ounces by volume of warm boiled water. One pound of S. M. A. powder added to 3½ quarts of warm boiled water will make 4 quarts of mixture.

Gelatin in Feeding Infants and Children.—Jacobi in 1879 suggested the use of gelatin in infant feeding, and it has been used some ever since, but only recently has the real value of gelatin in the diet been made more widely known. It is very useful in rendering milk mixtures more digestible, preventing both gastric and intestinal indigestion (see Gelatin) by preventing the large hard curds. Where the appetite is poor, the addition of gelatin makes the milk more palatable for some children. It is of value in infants who regurgitate or vomit their food, in diarrhea particularly where there is putrefaction. It is useful where gas is formed either in the stomach or intestines, and in fermentative conditions in general. It is useful in preventing colic in some babies, and in the breast fed may be given in solution just before the feeding. In infants who are constipated and who have large hard stools which do not adhere to the napkin the addition of gelatin to the formula usually corrects the difficulty. It is also most useful in other cases of constipation. It is of great value in celiac disease not only in supplying additional much needed food, but in correcting the accompanying indigestion. In malnutrition the addition of gelatin to the dietary is of great value, as it is in those who have lost weight through operations, fever, or other illnesses. It has also been suggested in scurvy.

One-half teaspoonful to the day's feeding is usually sufficient for infants from three weeks to five months of age, and 1 teaspoonful for older infants. Older children may take more either in milk or as a jelly flavored with fruit juice or with other flavors. When adding it to the milk soak the gelatin in an ounce or two of cold milk from the formula. Then add an equal amount of hot milk from the formula, stir, and when dissolved, add to the formula. It may also be dissolved in part of the water used in making up the formula.

For breast-fed children use ½ teaspoonful of gelatin, 8 ounces of cold water; when soft add 8 ounces of boiling water, stir until dissolved. If not taken, a saccharin tablet may be added, but this is rarely necessary. Two teaspoonfuls may be given before feeding.

Another formula is ½ to 1 teaspoonful gelatin, 1 level tablespoon barley flour, 1 or 2 tablespoons of sugar, ⅛ teaspoonful salt, add

enough water to make a thin paste; when the gelatin is soft add a pint of water and boil until clear. This may be fed as it is to breast-fed children, or have the proper amount of milk added to it to make the correct formula according to the weight and age of the child.

Malted Milk.—This is valuable food in certain conditions. It may be used temporarily when pure milk cannot be obtained and in traveling.

In some digestive disturbances it is also useful. It may also be added to milk mixtures.

The composition of Horlick's malted milk is—

Fats	8.78
Protein	16.35
Dextrin	18.80
Lactose and maltose	49.15
(Total soluble carbohydrates 67.95.)	
Inorganic salts	3.86
Moisture	3.06

It is low in fats and high in sugars. Per ounce dry it has a food-value of about 127 calories. One ounce in 8 ounces of water makes a mixture containing approximately 1 per cent. fat, 2 per cent. protein, and 8.5 per cent. sugar. The caloric needs of the infant are easily covered in the solutions ordinarily used, but for continuous use has much the same objections as condensed milk. If used over considerable periods, orange-juice or other fresh fruit-juice must be given, and fat either as cream or olive oil. When cream or olive oil is given a little less milk may generally be used.

Malt Soups.—The idea of using malted foods was first published by Liebig in 1863. He endeavored to prepare a food that should be chemically and physiologically correct. Keller in 1898 modified the Liebig formula, and his method was as follows: 50 grams (2 ounces) of wheat flour to ⅓ liter, (11 ounces) of milk, with constant stirring. In a second vessel 100 grams of malt-soup extract or malt extract, with the addition of 10 c.c. (2½ drams) of a 10 per cent. solution of potassium carbonate, are dissolved in ⅔ liter (20 ounces) water at 120° F. The mixtures are then mixed and boiled for three or five minutes. This is said to contain—

Protein	2	per cent.
Fat	1.2	"
Carbohydrate (maltose)	12.1	"

The caloric value is 808 calories per liter, or somewhat more than either mothers' or cows' milk.

This may be diluted with water as desired, and approximately the same dilutions as made with cows' milk may be used. Cream may be added if desired, but, as a matter of fact, the cases in which the food is indicated do not, as a rule, bear the addition of much fat.

A preparation of maltose and potassium carbonate, *Loefland's*

malt-soup extract, is much used, as it simplifies the measuring. Any thick malt extract with the potassium carbonate (not bicarbonate) may be used. The bicarbonate is liable to cause vomiting. Maltose often causes diarrhea, and the flour added usually counteracts this.

Dry malt soup stock may also be had and this simplifies the preparation of malt soup mixtures.

Malted Gruels.—Malted gruels are advocated by some, especially in preparing milk for infants with weak digestion. They are prepared in the following manner: A tablespoonful of barley flour or of any other flour desired is boiled in a little more than a pint of water for fifteen minutes. As soon as it has cooled a teaspoonful of a good malt extract or a teaspoonful of diastase is added. This mixture is stirred thoroughly, and may then be used in the place of ordinary barley-water. Diastase preparations are made by most of the leading manufacturing chemists. Diastoid, made by the firm of Horlock, maltine, and diazyme are preparations of this class. The thick malt extracts are sometimes given to infants just before a feeding. Of these, several doses may be given daily for indigestion and constipation.

Chapin suggests that a home-made decoction of malt be used in making malted gruel. His directions are as follows: "A tablespoonful of malted barley grains is put in a cup, and enough cold water added to cover it—usually two tablespoonfuls—as the malt quickly absorbs some of the water. This is prepared in the evening and placed in a refrigerator overnight. In the morning the water, looking like thin tea, is removed with a spoon or skimmed off, and is ready for use. About a tablespoonful of this solution can be secured and is very active in diastase. It is sufficient to dextrinize a pint of gruel in ten to fifteen minutes. This should be prepared fresh every day."

Standardized Gruels.—Chapin has suggested using gruels of definite strength, so that one may know the value of food given as gruel, and also the percentages of the various elements. He determined that the weight of the various measures of different cereals were as follows:

1	level	tablespoonful of	pearl barley	weighs	$\frac{1}{4}$	ounce	avoirdupois.
1	“	“	barley flour	“	$\frac{1}{4}$	“	“
1	“	“	wheat flour	“	$\frac{1}{4}$	“	“
1	“	“	rolled oats	“	$\frac{1}{4}$	“	“
1	ounce	dipper of	pearl barley	“	$\frac{1}{4}$	“	“
1	“	“	barley flour	“	$\frac{1}{4}$	“	“
1	“	“	wheat flour	“	$\frac{1}{4}$	“	“
1	“	“	rolled oats	“	$\frac{1}{4}$	“	“

The percentage of various food components in gruels will be found to be approximately as follows:

	Pearl barley.		Barley flour.		Wheat.		Rolled oats.	
	Protein.	Carbo-hydrates.	Protein.	Carbo-hydrates.	Protein.	Carbo-hydrates.	Protein.	Carbo-hydrates.
1 oz. to quart	0.14	1.34	0.195	2.093	0.331	2.161	0.262	1.669
2 ozs. to quart ...	0.28	2.68	0.390	4.186	0.662	4.322	0.524	3.338
3 " " ...	...	...	0.585	6.279	0.993	6.483	0.786	5.007
4 " " ...	...	...	0.780	8.372	1.324	8.644	1.048	6.676
5 " " ...	...	...	0.975	10.465	1.655	10.805	1.310	8.345
6 " " ...	...	...	1.170	10.558	1.986	12.960	1.572	10.014
7 " " ...	...	...	1.365	14.651	2.317	15.127	1.834	11.683
8 " " ...	...	...	1.560	16.744	2.648	17.288	2.096	13.352

Plain gruels cannot be made much stronger than 2 ounces to the quart.

Dextrinized gruels may be made up to as high as 8 ounces to the quart.

Another method is to use cereal flours. The percentages furnished by these flours will be found under the heading of Farinaceous Gruels in the first part of this volume. The cereal flours are, as a rule, very much better, as they make a smoother gruel and require much less cooking, fifteen to twenty minutes giving as satisfactory a gruel as boiling rice or barley grains for three or four hours. The cereal gruels are very useful in modifying milk, and they may also be used alone in various diseases of the stomach and intestine. As they generally do not cause fermentation they are of great value in some forms of diarrhea.

Oatmeal is of use in constipation, and the others are of value in diarrheas. Corn-meal gruels are valuable in the underfed.

The cereal flours contain about 100 calories to the ounce, and the underfeeding which occurs when a thin gruel is used is very apparent.

Thick Cereal Gruels.—These are very useful in infants who vomit easily, in pylorospasm, and in certain cases of malnutrition. The gruels may vary in composition; in the beginning skimmed milk and one of the cereal flours, barley, oat, rice, imperial granum or farina, cream of wheat, or other cereals. These should be boiled together for thirty minutes or more, or, if a double boiler is used, two hours or more. The resulting mixture should barely fall off an inverted spoon. If this goes well, cream may be gradually added. Cane-sugar or dextrimaltose may be added after cooking if thought advisable. A good formula is 1 level tablespoonful of flour, 8 ounces of skimmed milk, and 1/8 teaspoonful of salt. This is to be cooked until thick.

Butter and Flour Gruel.—Czerny and Kleinschmidt and others have reported favorably on the use of what they call Buttermehlsuppe in infants who did not do well on cow's milk. It is made with 7 gm. butter, 7 gm. flour, and 5 gm. sugar in 100 gm. of the vehicle. The butter is heated and stirred with a wooden spoon until it foams and

the odor of fat acids disappears, which occurs in from three to five minutes. Then the fine wheat flour is added and blended with the melted butter and cooked on an asbestos plate until the whole is thin and brownish (about four or five minutes). Then the warm water and sugar are added, and the whole boiled up and forced through a hair sieve; then the boiled and cooled milk added. The proportions between the butter and the flour must always be the same, but the other ingredients can be modified. We have had no experience with this.

The Soy Bean.—In certain conditions the soy bean (see same and Diabetes) is of great value. In cases when milk is badly borne, in certain forms of intestinal disorders, in diarrhea, and especially in the convalescence after diarrhea, in certain cases of marasmus and in malnutrition, the soy bean flour, properly used, is of great value.

Each ounce contains 13 grams protein and 120 calories.

	Protein. Per cent.	Fat. Per cent.	Sugar. Per cent.	Calories. Per cent.
¼ ounce, 1 level tablesponful to quart	0.35	0.15	0.08	30
½ " 2 " tablespoonfuls "	0.70	0.30	0.15	60
¾ " 3 " " "	1.0	0.45	0.23	90
1 ounce to quart	1.4	0.60	0.30	120
2 ounces to quart	2.80	1.20	0.60	240
3 " "	4.20	1.80	0.90	360
4 " "	5.60	2.40	1.20	480
5 " "	7.00	3.00	1.50	600
6 " "	8.40	3.60	1.80	720
7 " "	9.80	4.20	2.10	840
8 " "	11.00	4.80	2.40	900

A quart of gruel is made by boiling from 1 level tablespoonful to 6 ounces of the soy gruel in 1 quart of water for fifteen minutes, adding water to make up for loss by evaporation. Salt should be added to taste.

These gruels do not thicken during cooking, as they contain no starch, and readily settle on standing. This may be overcome by adding 1 to 2 heaping teaspoonfuls of barley, oat or wheat gruel flour before cooking, which will add 0.6 per cent. to 1.2 per cent. starch to the gruels, and also slightly increase the percentage of protein.

A good standard gruel, which may be diluted as desired, may be made by using 1 ounce of soy bean flour, 2 ounces of barley flour, to a quart of water. This will contain 2 per cent. protein, 0.60 per cent. fat, and 5.10 per cent. carbohydrate, with a caloric value of 320 calories or 10 calories per ounce. This is just half the value of milk. It may be further increased by adding an ounce of sugar, which brings it up to about 430, and the yolk of one egg will add 55 calories more, or cream may be added, each ounce increasing the food value about 50 calories. About one ounce and a half of this to each pound of the babies' weight will about cover the caloric needs

of the baby. Without the cream or egg it will require about four ounces per pound of body-weight. As this is more than can be given to advantage it should be remembered that the soy gruel should not be kept up unless the food-value is enhanced. This may often be done to advantage by adding condensed milk or cows' milk to the gruel. This standard gruel, or a weaker one, may be used to dilute milk to advantage in cases of marasmus. The infants' stools should be somewhat brownish in color, like malted-milk stools. If the gruels are used too strong to begin with, the stools will be foul smelling and generally thin. The bean should be withdrawn and barley or other cereal gruels given, and when the bean is added again it should be done gradually. Edsall and Miller have experimented with a bean flour, in which the starch is predigested by means of a diastasic ferment. They have found it useful in digestive disturbances and malnutrition.

Vegetable Broths.—Méry recommends the use of the following vegetable broth as a substitute for milk after gastro-enteritis:

Potatoes	60	grams.
Carrots	45	"
Turnips	15	"
Dried peas	6	"
Dried beans	6	"
Water	1000	"

Boil in a covered earthen pot for four hours, strain and add water to make 1 liter, and 5 grams of salt.

Vegetable Purées.—In infants who are not gaining and in cases of constipation and in some other nutritional disturbances, as well as for the healthy infant, we have found the following vegetable purée to be of great value:

A mixture is made of any sort of vegetable available—potatoes, carrots, beets, turnips, greens of any kind—in fact any vegetable whatever except those that are highly flavored or contain aromatics. Naturally radishes, onions, green peppers, cucumbers and the like should not be thought of in this connection. The vegetable so selected should be thoroughly washed and then cut up or chopped into small pieces not larger than a quarter of an inch in diameter, and if a good mill is at hand they may be run through that to advantage. They are then covered with sufficient water and placed on the stove and allowed to cook very thoroughly. Additional water may be added from time to time and the surface skimmed as may be necessary. The water in which the vegetables are cooked is to be utilized and care should be taken that it is not thrown away. The material is then passed through a sieve and all the coarse particles discarded and, if necessary, the resulting mass cooked again until it is as thick as an ordinary thick soup. This, in a sterile vessel placed in the ice box, keeps very well, and from one-quarter to a tablespoonful may be used according to the age of the child and the nature of the dis-

turbance for which it is given. It may be added to milk or to broths or served over cereals.

Olive Oil.—This is most useful where cream disagrees and where it is imperative to supply nourishment. It is sometimes of service in constipation in thin infants. From one to four teaspoonfuls may be given daily. We begin with one-quarter teaspoonful once or twice a day after feeding, and increase one dose a day until this amount is given after every feeding. It may then be increased to half a teaspoonful at a dose if thought advisable. One-quarter to one-half ounce a day is as much as it is advisable to use in young infants. Older ones may take somewhat more. Olive oil furnishes 245.5 calories per ounce by volume.

Homogenized Oil Mixtures.—By using a machine which drives oils or mixtures containing them through a fine agate valve against a pressure of from 3000 to 5000 pounds to the square inch emulsions of oils may be obtained that are homogeneous, that is, they will not separate on standing. Ladd has used olive oil and milk mixtures treated in this way with considerable success in infant feeding. The very finely divided oil being more easily digested than the coarser emulsions.

FEEDING DURING THE SECOND YEAR

During the second year of life as much care is required in feeding as during the first. The fear of the second summer would largely be overcome if the child were not allowed to eat food unsuited to its digestion. The fact that some children thrive on almost any kind of food is no excuse for permitting a child to have the same food as its elders, as is so often done. Most of the illness and many of the deaths of childhood are traceable to improper diet.

During the second year milk should form the basis of the diet. In cities or where the milk-supply is not above suspicion, it is best to Pasteurize the milk until the second summer has been passed, or even longer if circumstances warrant. As a rule, the milk requires but little modification, and after the thirteenth month, and often before, may generally be taken unmodified. As the child is now able to digest starchy food, milk-sugar may be omitted. In cases where the milk is not thoroughly digested, as is evidenced by curds in the stools, lime-water may be used, and may be added in quantities of from 5 to 10 per cent., or even more if necessary. If the milk is very rich, it should be diluted either with lime-water or usually with plain sterile water—three parts of milk to one of water. If the milk is poor, or if milk that is not rich does not agree with the child, it may be prepared as follows: Fill a glass three-quarters full of milk, add one or two tablespoonfuls of cream, and fill to the top with plain water. If this does not answer, add a tablespoonful of lime-water. During illness and often under other circumstances the alkaline car-

bonated waters will be found useful for diluting the milk. If the milk is poor, another plan is to use the upper two-thirds of the milk.

Starchy food may be given in the form of gruel, either alone or, what is better, mixed with the milk. Barley-gruel or, if there is a tendency to constipation, oatmeal-gruel is added, one-fifth or one-fourth part of gruel being added to each feeding. The gruel should be freshly prepared and mixed immediately with the milk. A pinch of salt and a very small quantity of cane-sugar may be added to render it more palatable. It may then be Pasteurized like ordinary milk.

During the second year three to five meals should be given. The bottle should be dispensed with, and the food be taken from a cup or spoon. If the bottle is not taken from the child early, it may be difficult to break it of the bottle habit. The following diet lists for different ages will be found useful:

Diet List—Twelve to Fifteen Months

Foods permitted:

- Milk.
- Junket.
- Any well-cooked cereal, as cream of wheat or rice, farina, oatmeal, arrow root, cornstarch, barley flour.
- Crackers, zwieback, toast, whole wheat bread, stale bread.
- Coddled or soft-boiled egg two or three times a week.
- Crisp bacon.
- Orange juice, prune juice, prune pulp, apple sauce, or baked apple.
- Vegetables: Baked or mashed potato, carrots, soft beets, salsify, squash, stewed tomato juice, string beans, lima beans, peas, asparagus tips, soft parts of cauliflower. The harder vegetables and those with skin or pulp should be passed through a sieve, the others may be mashed.
- Soups or broths made of chicken, beef, mutton, thickened with flour, cereals, or vegetables. Vegetable soup or mixture.
- Sparingly of jelly and honey. Gelatin jelly.

Schedule:

6 A. M. or on waking—Milk.
8 A. M.—Fruit juice, 2 or 3 tablespoons.
10 A. M.—Bottle, 8 ounces.
Crisp bacon, 1 slice.
Cereal, 6 ounces, or one slice of toast or zwieback in milk.
2 P. M.—Vegetable soup, 6 ounces, or
Vegetable mixture, 6 ounces, or
Vegetables—a starchy vegetable, as baked potato or carrots, 1 to 4 tablespoons, and a green vegetable, as spinach, 1 to 3 tablespoons.
Gelatin jelly or junket or custard.
6 P. M.—Cereal as at 10 A. M., or toast milk or crackers and milk.
Milk, 8 ounces. Bread with jelly or honey, one small slice.
10 P. M.—If needed or ordered—milk, 8 ounces.

Diet List—Fifteen to Eighteen Months

7 A. M.—Any well-cooked cereal, 8 ounces, with milk, or
A bowl of bread and milk, or
A slice of crisp bacon; crackers, toast, or zwieback.

8 or 9 A. M.—Orange or prune juice, prune pulp, or apple sauce.

10.30 A. M.—Milk, 8 ounces, with a slice of stale bread, toast, or zwieback.

2 P. M.—One of the following:

A. Soft-boiled or coddled egg with bread crumbs.
B. 8 ounces of meat broth (chicken, beef, mutton, lamb, or veal), with stale bread crumbs or rice or barley added to it.
C. 8 ounces of vegetable soup, with or without bread crumbs or rice or barley.
D. A tablespoonful of mashed or baked potato, with meat broth or gravy or cream; milk to drink.
E. Scraped raw or rare beef or mutton, or well-done white meat of chicken, a tablespoonful or two with crackers, toast, or stale bread. Milk to drink.

One or two tablespoons of any well-cooked vegetable, spinach, carrots, lettuce, oyster plant, soft beets, string beans, peas, asparagus tips, soft parts of cauliflower, stewed tomato, squash, etc. Vegetables should be mashed, and if stringy or with hulls, passed through a sieve.

One of the following: Gelatin, junket, custard, tapioca, cornstarch pudding, stewed fruit.

5.30 or 6 P. M.—Milk, 8 ounces, zwieback, toast or stale bread, or cereal; a little honey or jelly occasionally.

Diet List—Eighteen Months to Two and One-half Years

7 or 8 A. M.—Any well-cooked cereal, 8 ounces, with milk, or
A bowl of bread and milk, or
A slice of crisp bacon, or
A soft-boiled egg or coddled egg; crackers, toast, or zwieback.
Orange or prune juice, prune pulp or apple sauce. This fruit may be given on waking, just after the meal or an hour or two later, as desired.

12 Noon—One of the following:

A. Soft-boiled or coddled egg, with bread crumbs.
B. 8 ounces of meat broth (chicken, beef, mutton, lamb, veal), with stale bread crumbs or rice or barley added to it.
C. 8 ounces of vegetable soup, with or without bread crumbs or rice or barley.
D. A tablespoonful of mashed or baked potato, with meat broth or gravy or cream. Milk to drink.
E. Scraped raw or rare beef or mutton or well-done white meat of chicken, a tablespoonful or two with crackers, toast, or stale bread. Milk to drink.

One or two tablespoons of any well-cooked vegetable, spinach, carrots, lettuce, oyster plant, soft beets, string beans, peas, asparagus tips, soft parts of cauliflower, stewed tomato, squash, etc. Vegetables should be mashed, and if stringy or with hulls, passed through a sieve.

One of the following: Gelatin, junket, custard, tapioca, cornstarch pudding, stewed fruit.

3.30 P. M.—Crackers, cookies, zwieback, or milk bread or cocoa.

6. P. M.—Cereal and milk or bread and milk, toast bread, zwieback, or crackers. Stewed fruit. Milk to drink.

Diet List—Two and One-half to Six Years

Milk may be allowed with every meal (may be omitted for dinner if desired). The average child should take from a pint and a half to a quart a day plain, or when plain milk is not thoroughly digested, modified by adding barley-water or lime-water.

Cream: Two to 8 ounces a day, mixed with milk, taken as a beverage, with cereals, etc.

Cereals: Almost any kind of cereal for breakfast; oatmeal and wheaten grits are the best. Rice and hominy for dinner. Barley is useful in soups.

Bread and biscuits: May be allowed with every meal; stale bread, the so-called pulled bread, zwieback, and the various forms of biscuits or crackers.

Vegetables: May be allowed for dinner; potato in some form or a cereal with one green vegetable; spinach, cauliflower tops, and the like are best. Any vegetable that can be mashed up with a fork or passed through a sieve may be allowed.

Eggs: Are very good, but children are apt to tire of them easily. They should be given for breakfast, as a rule, but never day after day.

Meat: Allowed once a day for dinner, and in older children for breakfast occasionally. Boiled or broiled fish may be given for breakfast or dinner.

Broths or *soups* of simple composition may be eaten. Meat broths with cereals and cream are especially nutritious.

Desserts: Once a day with dinner. Plain custard, milk and rice pudding, bread and custard pudding, and junket are best. Ice cream once a week. Fruit should be given daily and only ripe fresh fruit in season should be used. The best are oranges, baked apples, and stewed prunes. Ripe peaches, pears, grapes without skins or seeds may be given. Fresh juice of berries in small quantities; strawberries in perfect condition sparingly. Ripe canteloupe and watermelon in moderate quantities may also be allowed. Great care should be used in choosing and giving fruit to children. It is a very important article of diet, but if stale, spoiled, or unripe is capable of doing much harm. Too much should not be given in warm weather. Lemonade is useful during very hot weather.

According to Meals

Breakfast: Every day, milk to drink. A well-cooked cereal with salt and cream, but little or no sugar. Bread and butter. In addition to the above, one of the following every day: Eggs lightly boiled or poached, and, for older children, scrambled or made into a plain omelet. Boiled or broiled fish. For older children a very little finely chopped beef, beefsteak, or mutton chop. For younger children meat

Milk:
Buttermilk,
Cream,
Curd,
Kumiss,
Malted milk,
Peptonized milk,
Sweet milk,
Whole milk.

Soups:
Barley soup,
Beef broth,
Chicken broth,
Mutton broth,
Noodle soup,
Potato soup,
Rice soup,
Veal broth,
Vegetable soup.

Purées and Creams:
Asparagus,
Bean,
Celery,
Pea,
Potato,
Tomato.

Meats:
Broiled,
Boiled,
Hashed,
Roast,
Stewed,
Crisp bacon,
Beef—roast,
Beefsteak,
Lamb,
Lamb chops,
Mutton.

Poultry:
Chicken,
Squab,
Turkey.

Eggs:
Boiled,
Coddled,
Poached.

Fish:
Baked,
Boiled,
Broiled,
Bass,
Bluefish,
Flounder,
Haddock,
Herring,
Halibut,
Mackerel,
Perch,
Shad,
Trout,
Whitefish.

Cereals:
Barley,
Cornmeal,
Cracked wheat,
Cream of wheat,
Cream of rice,
Farina,
Oatmeal,
Rice,
Rolled oats.

Breads:
Bran,
Bran muffins,
Cornbread,
Crackers,
Graham bread,
Rye,

Breads:
Stale bread,
Toast,
White bread,
Zwieback.

Fruits:
Raw or stewed apples,
Bananas (baked),
Figs,
Grapes,
Grape-fruit,
Oranges,
Peaches,
Pears,
Prunes,
Tangerines,
Tomatoes.

Vegetables:
Asparagus,
Beans (string),
Beets,
Cauliflower,
Carrots,
Celery (stewed),
Greens,
Kale,
Lettuce,
Peas,
Potatoes,
Rhubarb,
Salsify,
Spinach,
Sprouts,
Turnips.

Desserts:
Bread pudding,
Cornstarch,
Cup custard,
Gelatin,
Ice-cream,
Junket,
Rice.

at breakfast is not, as a rule, necessary. Fruit may be given before or after breakfast, during the latter part of the morning, or at about noon; one variety daily, and if there is a special tendency to constipation, stewed prunes or baked apples may be allowed with dinner, but not on the days on which they have been used earlier. Oranges, baked apples, stewed prunes, peaches, pears, grapes without skins or seeds, ripe apples (the softer varieties may be given, those known by dealers as "hard apples" are not suitable unless cooked) are the best.

Dinner: Bread and butter as desired every day; not to be eaten to the exclusion of other foods, however.

One soup each day: Bouillon, beef, chicken, veal, mutton or oyster broth, which may be thickened with barley or other cereals (either grain or flour). Milk and cream may be added where desirable.

One meat daily, roasted or broiled: Beefsteak, beef, lamb or mutton chop, rare roast beef or mutton, chicken (white meat), or roast turkey.

Two vegetables daily: One green and one other vegetable, usually potato in some form, should be given. Potatoes baked or mashed, cauliflower tops, stewed celery, spinach, asparagus tips, hominy, plain macaroni, mashed peas, young string beans, and almost any green vegetable in season.

Dessert: Junket is best and may be given most frequently, but rice and milk pudding, plain custard and plain tapioca pudding may also be used in small quantities. Ice-cream once a week. Fruit may be used in some cases.

Supper: Very light simple suppers should be given each day. Milk, milk toast, bread and butter, and, for older children, a little stewed fruit or baked apple without too much sugar.

Articles Forbidden

The following articles should not be allowed children under four years of age, and with few exceptions, they may be withheld with advantage up to the seventh year:

Meats: Ham, sausage, pork in all forms except bacon, salted fish, corned beef, dried beef, geese, game, kidney and liver.

Vegetables: Fried vegetables of all varieties, cabbage, potatoes except when boiled or roasted, raw or fried onion, cucumber, egg plant and green corn.

Bread and Cake: All hot bread and rolls, buckwheat and all other griddle cakes; all sweet cakes, particularly those containing dried fruits and those heavily frosted.

Desserts: All nuts, candies, pies, tarts, and pastry of every description.

Drinks: Tea, coffee, wine, beer, and cider.

Fruits: All dried fruits, all fruits out of season and stale fruits, particularly in summer.

The meals should be given at fixed hours, which practice should be strictly adhered to. Feeding between meals, even when consisting of the most trifling things, should be avoided. If the child can not go from one meal to another without discomfort, the intervals should be shortened. In certain cases it may be advisable to give a small cup of milk or broth and a cracker between the meals, at stated intervals, as in feeding younger children.

Candies, cake and the like should be kept from young children. In well-regulated homes, if he once learns that he can not have them, the child will soon cease to demand sweets. The frequent indulgence in sweets of various kinds creates a desire for them to the exclusion of the other foods. This craving is analogous to that for alcohol in

WEIGHT—HEIGHT—AGE TABLES FOR INFANCY AND EARLY CHILDHOOD

(Robert M. Woodbury, Supplement to the July, 1923, issue of Mother and Child)

Weight—Height—Age Table for Boys from Birth to School Age

Height, inches.	Average weight for height, pounds.	1 mo.	3 mos.	6 mos.	9 mos.	12 mos.	18 mos.	24 mos.	30 mos.	36 mos.	48 mos.	60 mos.	72 mos.
20	8	8											
21	9½	9	10										
22	10½	10	11										
23	12	11	12	13									
24	13½	12	13	14									
25	15	13	14	15	16								
26	16½		15	17	17	18							
27	18		16	18	18	19							
28	19½			19	19	20	20						
29	20½			20	21	21	21						
30	22			22	22	22	22	22					
31	23				23	23	23	23	24				
32	24½				24	24	24	25	25				
33	26					26	26	26	26	26			
34	27						27	27	27	27			
35	29½						29	29	29	29	29		
36	31							30	31	31	31		
37	32							32	32	32	32	32	
38	33½								33	33	33	34	
39	35								35	35	35	35	
40	36½									36	36	36	36
41	38										38	38	38
42	39½										39	39	39
43	41½										41	41	41
44	43½											43	43
45	45½											45	45
46	48												48
47	50												50
48	52½												52
49	55												55

Notes: 1. Weight is stated to the nearest pound; height to the nearest inch; age to the nearest birthday. 2. Up to and including 34 inches the *weights are net.* Above this the following amounts have been added for clothing (shoes, coats, and sweaters are not included):

35 to 39 inches 1¼ pounds
40 to 44 inches 1½ pounds
45 to 49 inches 1¾ pounds

adults. Overindulgence in sweets causes indigestion, headache, and the like, ailments that may easily be prevented.

The child should be taught to eat slowly and to chew the food well. To this end, some older individual should always be present at meal-times to see that sufficient time be taken for the meal, and that the food be finely divided, as young children do not, as a rule, chew very

Weight—Height—Age Table for Girls from Birth to School Age

Height, inches.	Average weight for height, pounds.	1 mo.	3 mos.	6 mos.	9 mos.	12 mos.	18 mos.	24 mos.	30 mos.	36 mos.	48 mos.	60 mos.	72 mos.
20	8	8											
21	9	9	10										
22	10½	10	11										
23	12	11	12	13									
24	13½	12	13	14	14								
25	15	13	14	15	15								
26	16½		15	16	17	17							
27	17½		16	17	18	18							
28	19			19	19	19	19						
29	20			19	20	20	20						
30	21½			21	21	21	21	21					
31	22½				22	22	23	23	23				
32	24					23	24	24	24	25			
33	25						25	25	25	26			
34	26½						26	26	26	27			
35	29						29	29	29	29	29		
36	30							30	30	30	30	31	
37	31½							31	31	31	31	32	
38	32½								33	33	33	33	
39	34								34	34	34	34	34
40	35½									35	36	36	36
41	37½										37	37	37
42	39										39	39	39
43	41										40	41	41
44	42½											42	42
45	45												45
46	47½												47
47	50												50
48	52½												52

Notes: 1. Weight is stated to the nearest pound; height to the nearest inch; age to the nearest month. 2. Up to and including 34 inches the *weights are net.* Above this the following amounts have been added for clothing (shoes and sweaters are not included):

35 to 39 inches 1 pound
40 to 44 inches 1½ pounds
45 to 49 inches 1¾ pounds

well. The quantity given to a healthy child should depend on his appetite. In sick children this is not a reliable guide, and, where possible, fixed amounts may be given (see Feeding of Sick Children). The child should not be forced to eat, nor should he be given special articles to tempt the appetite. If the food offered is not taken, it is well to wait until the next meal, when it will generally be found that the appetite has returned. Loss of appetite is often merely an indication that the digestive organs require a slight rest.

During the heated portions of the year the child will require less solid and more liquid food. The same is true during sickness. Many of the gastro-intestinal disturbances attributed to teething are the result of improper feeding.

Diet and Teeth.—This is little understood, but that there is some relation has been known from early times. It has also been stated that the comparative non-use of the teeth is a big factor in their decay, and that with the refinement of foods, so that they no longer need chewing, the trouble begins. That the increased use of sugar and bolted flour bears a close relation to dental caries is almost axiomatic, and many hold that this is responsible for frequent decay noted in the teeth of school children.

Various observers have pointed out that the composition of the bones of animals can be changed by varying their rations (see also Rickets), and that this was largely dependent on the phosphorus and calcium content of the food and the calcium depositing vitamin (see same).

Howe has been able to decalcify the teeth of experimental animals and to recalcify them by changing the diets. The decalcifying took place on diets deficient in vitamins A, B, and C, and adding foods rich in these vitamins caused recalcification. Robb and his associates have shown that in scurvy in experimental animals the teeth become deficient in calcium and decay.

Interesting too is the relation of milk feeding to dental caries. Durand gives the table on page 328 showing the effect of milk on dental caries.

Notes Referring to Tables on Pages 326 and 327.

The tables are to be used as follows:

Take, for example, a fourteen-year-old boy, who is 64 inches tall. By following the numbers horizontally opposite the figure 64 it will be found that he should weigh 113 pounds. A twelve-year-old boy who is 64 inches tall should weigh 109 pounds and an eighteen-year-old boy should weigh 126 pounds.

Age is taken at the nearest birthday; height at the nearest inch; and weight at the nearest pound. A child is considered six years old at any time between five and one-half and six and one-half years.

The figures not starred represent exact averages in round numbers.

The starred figures represent smoothed or interpolated values.

For Boys:

The following percentage of net weight has been added for clothing (shoes, coats, and sweaters are not included):

For weights from 35 to 63 pounds—3.5 per cent. of net weight is added.

For weights 64 pounds and over—4 per cent. of net weight is added.

For Girls:

The following percentage of net weight has been added for clothing (shoes and sweaters are not included):

For weights from 35 to 65 pounds—3 per cent. of net weight is added.

For weights from 66 to 82 pounds—2.5 per cent. of net weight is added.

For weights from 83 pounds and over—2 per cent. of net weight is added.

Weight—Height—Age Tables

(Baldwin and Wood, A Supplement to July, 1923, issue of Mother and Child)

Weight—Height—Age Table for Boys of School Age

Height, inches.	Average weight for height, lbs.	5 Years.	6 Years.	7 Years.	8 Years.	9 Years.	10 Years.	11 Years.	12 Years.	13 Years.	14 Years.	15 Years.	16 Years.	17 Years.	18 Years.	19 Years.	Height, inches.
38	34	34	34*														38
39	35	35	35														39
40	36	36	36*														40
41	38	38	38	38*													41
42	39	39	39	39*	39*												42
43	41	41	41	41*	41*												43
44	44	44	44	44	44*												44
45	46	46	46	46	46*	46*											45
46	48	47*	48	48	48	48*											46
47	50	49*	50	50	50	50*	50*										47
48	53		52	53	53	53	53*										48
49	55		55	55	55	55	55	55*									49
50	58		57*	58	58	58	58	58*	58*								50
51	61			61	61	61	61	61	61*								51
52	64			63	64	64	64	64	64	64*							52
53	68			66*	67	67	67	67	68	68*							53
54	71				70	70	70	70	71	71	72*						54
55	74				72*	72	73	73	74	74	74*						55
56	78				75*	76	77	77	77	78	78	80*					56
57	82					79*	80	81	81	82	83	83*					57
58	85					83*	84	84	85	85	86	87					58
59	89						87	88	89	89	90	90	90				59
60	94						91*	92	92	93	94	95	96				60
61	99							95	96	97	99	100	103	106*			61
62	104							100*	101	102	103	104	107	111	116*		62
63	111							105*	106	107	108	110	113	118	123	127*	63
64	117								109	111	113	115	117	121	126	130*	64
65	123								114*	117	118	120	122	127	131	134	65
66	129									119	122	125	128	132	136	139	66
67	133									124*	128	130	134	136	139	142	67
68	139										134	134	137	141	143	147	68
69	144										137	139	143	146	149	152	69
70	147										143	144	145	148	151	155	70
71	152										148*	150	151	152	154	159	71
72	157											153	155	156	158	163	72
73	163											157*	160	162	164	167	73
74	169											160*	164	168	170	171	74

Age—years.		6	7	8	9	10	11	12	13	14	15	16	17	18	19
Average height, inches.	Short	43	45	47	49	51	53	54	56	58	60	62	64	65	65
	Medium	46	48	50	52	54	56	58	60	63	65	67	68	69	69
	Tall	49	51	53	55	57	59	61	64	67	70	72	72	73	73
Average annual gain, lbs.	Short	3	4	5	5	5	4	8	9	11	14	13	7	3	
	Tall	4	5	6	6	6	7	9	11	15	11	8	4	3	
	Medium	5	7	7	7	7	8	12	16	11	9	7	3	4	

Weight—Height—Age Table for Girls of School Age

Height, inches.	Average weight for height, lbs.	5 Years.	6 Years.	7 Years.	8 Years.	9 Years.	10 Years.	11 Years.	12 years.	13 Years.	14 Years.	15 Years.	16 Years.	17 Years.	18 Years.	Height, inches.
38	33	33	33													38
39	34	34	34													39
40	36	36	36	36*												40
41	37	37	37	37*												41
42	39	39	39	39*												42
43	41	41	41	41	41*											43
44	42	42	42	42	42*											44
45	45	45	45	45	45	45*										45
46	47	47*	47	47	48	48*										46
47	50	49*	50	50	50	50	50*									47
48	52		52	52	52	52	53*	53*								48
49	55		54	54	55	55	56	56*								49
50	58		56*	56	57	58	59	61	62*							50
51	61			59	60	61	61	63	65							51
52	64			63*	64	64	64	65	67							52
53	68			66*	67	67	68	68	69	71*						53
54	71				69	70	70	71	71	73*						54
55	75				72*	74	74	74	75	77	78*					55
56	79					76	78	78	79	81	83*					56
57	84					80*	82	82	82	84	88	92*				57
58	89						84	86	86	88	93	96*	101*			58
59	95						87	90	90	92	96	100	103*	104*		59
60	101						91*	95	95	97	101	105	108	109	111*	60
61	108							99	100	101	105	108	112	113	116	61
62	114							104*	105	106	109	113	115	117	118	62
63	118								110	110	112	116	117	119	120	63
64	121								114*	115	117	119	120	122	123	64
65	125								118*	120	121	122	123	125	126	65
66	129									124	124	125	128	129	130	66
67	133									128*	130	131	133	133	135	67
68	138									131*	133	135	136	138	138	68
69	142										135*	137*	138*	140*	142*	69
70	144										136*	138*	140*	142*	144*	70
71	145										138*	140*	142*	144*	145*	71

Age—years.		6	7	8	9	10	11	12	13	14	15	16	17	18
Average height, inches.	Short	43	45	47	49	50	52	54	57	59	60	61	61	61
	Medium	45	47	50	52	54	56	58	60	62	63	64	64	64
	Tall	47	50	53	55	57	59	62	64	66	66	67	67	67
Average annual gain, lbs.	Short	4	4	4	5	6	6	10	13	10	7	2	1	
	Medium	5	5	6	7	8	10	13	10	6	4	3	1	
	Tall	6	8	8	9	11	13	9	8	4	4	1	1	

	Number examined.	Number showing caries.	Per cent.
Breast milk	418	118	28.2
Cow's milk	102	30	29.4
Sweetened condensed milk	32	17	53.1

Seagrave gives similar figures:

Breast milk	829	366	42.6
Cow's milk	232	102	42.9
Sweetened milk	61	41	72.1

Durand in his report says: "The significance of these statistics is that a poorly balanced diet, high in carbohydrate, low in fat, protein, and mineral matter, fed during the period in which the teeth are developing and calcifying in the jaws, seems to have rendered them doubly sensitive to decay."

Without going into further details it may be confidently stated that there is a close relation between the composition of the teeth, and hence their liability at times to decay and the general nutrition, whether the poor nutrition from other than dietetic causes produces the same effects needs further study, but it in all probability does. To protect the teeth the diet must be looked after from birth to old age, but it is of primary importance to have an adequate diet when the teeth are being formed in the jaws, otherwise the foundations are laid for poor teeth and early decay.

The dietary requisites for dental growth and protection are simple—a well-balanced ration in every particular. Of primary importance is the presence of *sufficient of all the vitamins,* of sufficient calcium and phosphorus, and sufficient protein of the right kind. Hence a diet of milk, eggs, rough foods, whole wheat bread, whole cereals, vegetables, green salads, fresh fruits is indicated. Some praise the use of dates, figs and raisins, and advise eating the fruit last, so that the alkalinity of the mouth may be kept up. To be avoided or used sparingly are diets high in carbohydrate, sugars, and foods rich in them, as candy and sweet cakes, bolted flours, and decorticated cereals. Sufficient hard food should be supplied especially to children so that they have something hard to chew on. Hard biscuits and crackers serve this purpose.

FOOD REQUIREMENTS OF CHILDREN AFTER INFANCY

The total number of calories required by the child must allow for basal metabolism, growth, muscular activity, food lost in excreta. There are some individual variations in requirements and the mode of life must also be considered. The basal metabolism requirements vary but little in children of the same age and weight; the amount of food needed for growth grows less with the age of the child until ten or eleven years, when it increases again. The need to cover muscular activity as a rule increases as the child gets older, but varies

greatly according to the life of the child. Holt and Fales, from their own observations and also from Benedict and Talbot, Gillett and

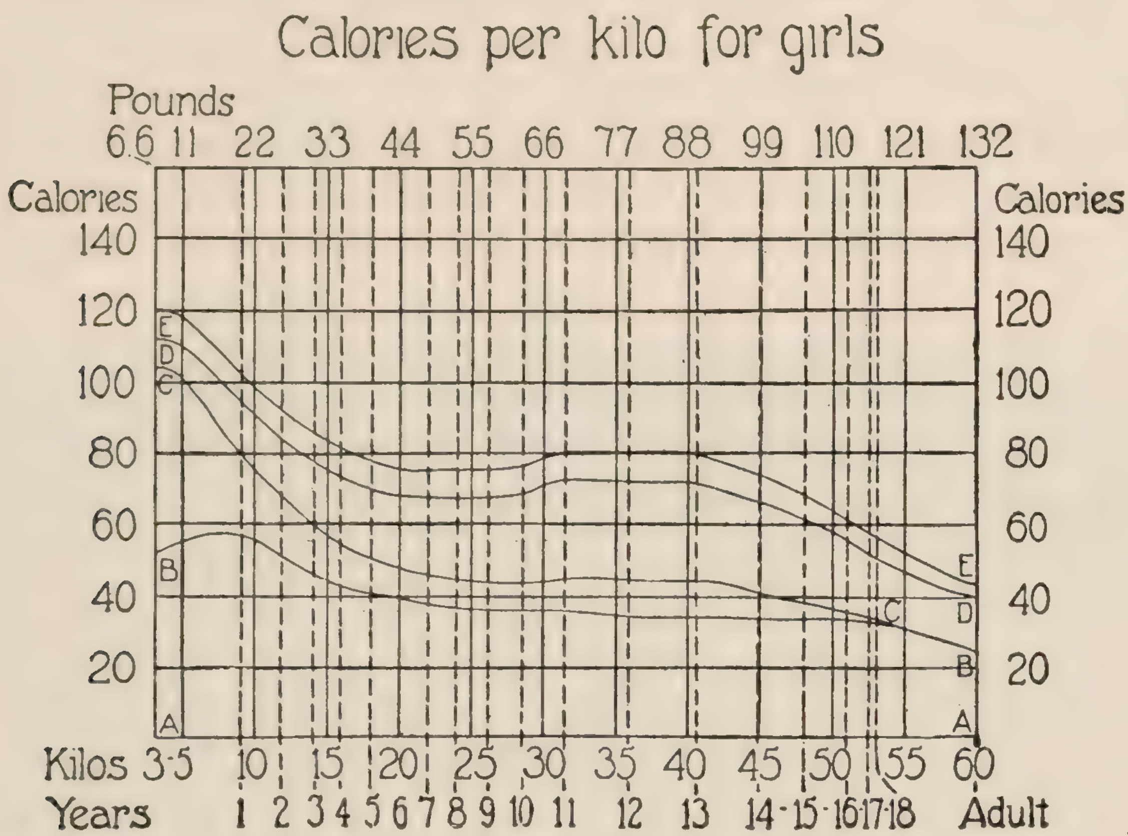

Fig. 3

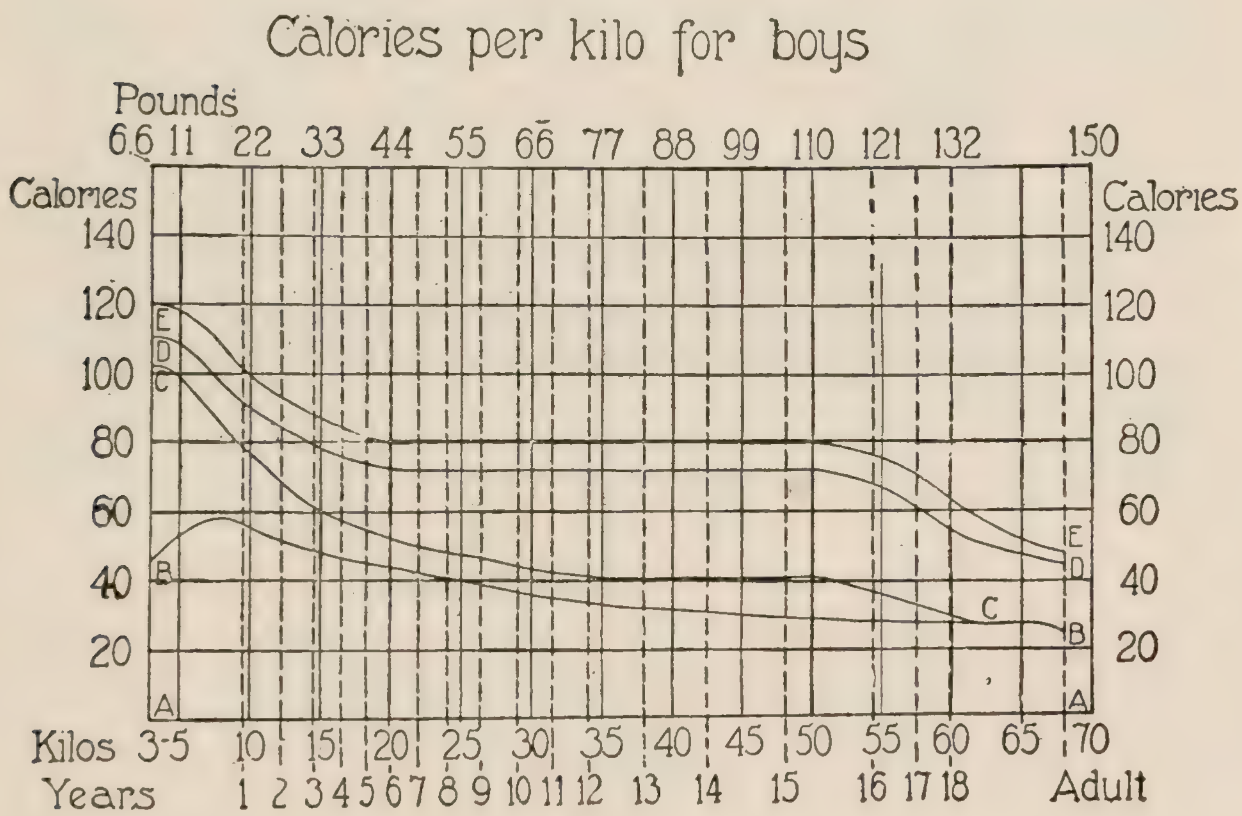

Fig. 4

Figs. 3 and 4.—The solid vertical lines indicate weights in kilos; the broken lines approximate weights at each year of age. The space between lines *AA* and *BB* shows allowance for basal metabolism; between *BB* and *CC* that for growth; between *CC* and *DD* that for muscular activity; between *DD* and *EE* food values lost in excreta. The space between the lines *AA* and *EE* shows the total caloric allowance per kilo. (Holt and Fales, Transactions of American Pediatric Society, Vol. XXXII, 1920.)

Sherman, and other authors, suggest the charts and table as a guide to the food requirements at various ages (Figs. 3–5).

The basal requirements, according to Benedict and Talbot, are highest at nine months of age and fall steadily up to adult life. The food lost in excreta after infancy is approximately 10 per cent. Holt and Fales place the average requirements as follows:

At one year about 100 calories per kilo; this falls to about 80 calories at six years and remains practically constant at this value up to the age of fifteen years, the increase needed for exercise being balanced by the decreased need of the basal metabolism. After a

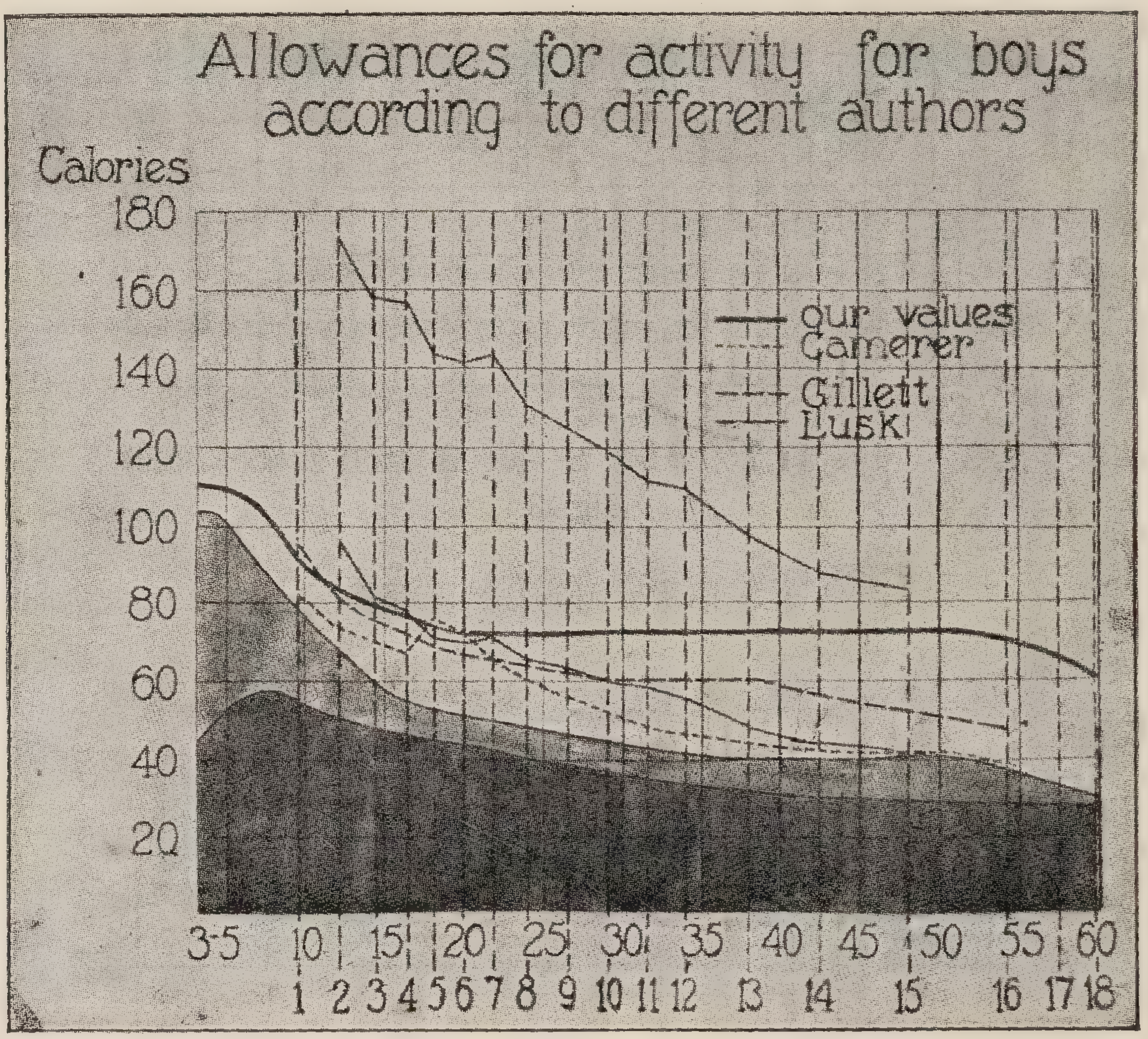

Fig. 5.—The heavily shaded area represents allowance in calories per kilo for basal metabolism; the lighter shaded area, the allowance for growth; both areas are according to Holt and Fales schedule. The spaces between the shaded area and the lines above show what remains for activity according to the estimates of different authors. The solid vertical lines indicate weight, the broken lines approximate weight at each year of age. (Holt and Fales, Transactions of American Pediatric Society, Vol. XXXII, 1920.)

weight of 50 kilos is reached (about fifteen years) the calories per kilo can rapidly be reduced to about 48 calories per kilo. The requirements for girls falls to 75 calories per kilo at six years, continues at this until ten years, when it rises because the basal metabolism is nearly constant, while there is an increase in need for growth and activity. The requirement remains at 80 calories per kilo until growth is complete, when it falls rapidly to adult standards, about 44 per kilo. Holt and Fales allow nearly 1000 calories more per day for

active adolescents of both sexes than is needed for the average adult man or woman of moderate activity. It should be borne in mind that children underweight require more calories and children overweight less calories per kilo. The tables are based on present-day knowledge and are in a measure tentative.

It is well to remember Benedict's statement: "It is still, however, the best practice to give a most liberal diet to children, since the greater part of the evidence on underweight indicates that children usually receive too little rather than too much food."

Holt and Fales give the tables on pages 331, 332 and 333.

The average distribution of the calories and food elements in the diet of properly fed American children is approximately: fat, 35; carbohydrates, 50, and protein, 15 for each 100, or approximately one-third in fat, one-half in carbohydrate, and one-sixth in protein. Owing to the difference in their caloric value the actual amounts of fat and protein are approximately equal.

Suggested Total Daily Calories

Age, Years	Boys					Girls				
	Average Weight		Calories per			Average Weight		Calories per		
	Kilos	Pounds	Kilo	Pound	Total Daily Calories	Kilos	Pounds	Kilo	Pound	Total Daily Calories
1	9.5	22	100	45	950	9.3	21	101	45	940
2	12.2	27	93	42	1,135	11.8	26	94	43	1,110
3	14.5	32	88	40	1,275	14.1	31	87	40	1,230
4	16.4	36	84	38	1,380	15.9	35	82	37	1,300
5	18.2	40	82	37	1,490	18.2	40	78	36	1,410
6	20.0	44	80	36	1,600	20.0	44	76	34	1,520
7	21.8	48	80	36	1,745	21.8	48	76	34	1,660
8	24.0	53	80	36	1,920	23.9	53	76	34	1,815
9	26.4	58	80	36	2,110	26.2	58	76	34	1,990
10	29.1	64	80	36	2,330	28.5	63	77	35	2,195
11	31.4	69	80	36	2,510	31.5	69	80	36	2,520
12	34.2	75	80	36	2,735	35.8	79	80	36	2,864
13	38.0	84	80	36	3,040	40.6	89	79	36	3,210
14	42.5	94	80	36	3,400	45.0	99	74	34	3,330
15	48.2	106	80	36	3,855	48.3	106	67	30	3,235
16	54.5	120	75	34	4,090	51.0	112	62	28	3,160
17	57.5	127	69	31	3,945	52.6	116	58	26	3,060
18	59.8	132	62	28	3,730	52.8	117	56	25	2,950
Adult	68.0	150	48	22	3,265	60.0	132	44	20	2,640

Protein Requirements of Children.—This cannot be said to be definitely settled. The value of the proteins from various sources given elsewhere should be borne in mind, and also the fact that more is needed during the periods of greatest growth. Holt summarizes the food intake of healthy American children as follows:

Suggested Calories Per Kilo for Boys

Weight, Kilos	Calories per Kilo					Per Cent. of Calories for				Total Calories Daily
	Basal	Growth	Activity	Excreta	Total	Basal	Growth	Activity	Excreta	
3	46	56	8	10	120	38	47	7	8	360
4	50	52	8	10	120	42	43	7	8	480
5	54	46	8	10	118	46	39	7	8	590
6	56	38	10	10	114	49	33	9	9	685
7	57	32	11	10	110	52	29	10	9	770
8	56	28	12	10	106	53	26	11	10	850
9	55	25	12	10	102	54	24	12	10	920
10	54	22	13	10	99	55	22	13	10	990
11	53	19	14	10	96	55	20	15	10	1,060
12	52	16	16	9	93	56	17	17	10	1,120
13	51	14	17	9	91	56	16	18	10	1,180
14	50	13	17	9	89	56	15	19	10	1,240
15	49	12	17	9	87	56	14	20	10	1,300
16	48	10	18	9	85	56	12	22	10	1,360
17	47	9	19	8	83	56	11	23	10	1,410
18	46	8	20	8	82	56	10	24	10	1,470
19	45	7	21	8	81	56	9	25	10	1,540
20	44	7	21	8	80	55	9	26	10	1,600
22	42	7	23	8	80	53	9	28	10	1,760
24	41	8	23	8	80	51	10	29	10	1,920
26	39	8	25	8	80	49	8	31	10	2,080
28	38	7	27	8	80	47	9	34	10	2,240
30	36	7	29	8	80	45	9	36	10	2,400
33	35	7	30	8	80	44	9	37	10	2,640
36	33	8	31	8	80	41	10	39	10	2.880
39	32	9	31	8	80	40	11	39	10	3,120
42	31	10	31	8	80	39	12	39	10	3,360
45	30	11	31	8	80	38	13	39	10	3,600
48	30	11	31	8	80	38	13	39	10	3,840
51	29	11	31	8	79	38	13	39	10	4,030
54	29	8	31	8	76	38	11	41	10	4,100
57	28	5	30	7	70	40	7	43	11	3,990
60	27	2	27	7	62	43	3	44	10	3,720
68 (Adult)	25	0	18	5	48	52	0	38	10	3,265

Average total protein in second and third years was 49 grams; 4.0 per kilo.
Average total protein in sixth and seventh years was 60 grams; 3.0 per kilo.
Average total protein in eleventh and twelfth years was 90 grams; 2.8 per kilo.
Average total protein in fifteenth and sixteenth years was 130 grams; 2.3 per kilo.
Average total protein in eighteenth year was 115 grams; 2.0 per kilo.

Over one year of age approximately 15 per cent. of the total calories should be supplied as protein and some two-thirds of this is animal protein.

Fat Requirements of Children.—It should be remembered that fat is a most important food element in growing children, aiding in the absorption of calcium, supplying certain fat vitamins, and a lack of fat is followed by grave disturbances of nutrition, among which is

Suggested Calories per Kilo for Girls

Weight, Kilos	Calories per Kilo					Per Cent. of Calories for				Total Calories Daily
	Basal	Growth	Activity	Excreta	Total	Basal	Growth	Activity	Excreta	
3	51	51	8	10	120	43	43	6	8	360
4	53	49	8	10	120	45	41	6	8	480
5	55	45	8	10	118	47	38	7	8	590
6	56	38	10	10	114	49	33	9	9	685
7	56	33	11	10	110	51	30	10	9	770
8	57	27	12	10	106	54	25	11	10	850
9	56	24	12	10	102	55	23	12	10	920
10	55	21	13	10	99	56	21	13	10	990
11	53	19	14	10	96	55	20	15	10	1,060
12	51	17	16	9	93	55	18	17	10	1,120
13	49	16	16	9	90	54	18	18	10	1,170
14	47	14	17	9	87	54	16	20	10	1,220
15	45	12	19	8	84	54	14	22	10	1,260
16	44	11	19	8	82	54	13	23	10	1,310
17	43	10	19	8	80	54	12	24	10	1,360
18	42	9	19	8	78	54	12	24	10	1,400
19	41	8	20	8	77	53	11	26	10	1,460
20	40	7	21	8	76	53	9	28	10	1,520
22	38	8	22	8	76	50	11	29	10	1,670
24	37	8	23	8	76	49	11	30	10	1,820
26	36	8	24	8	76	48	10	32	10	1,980
28	36	8	25	8	77	47	10	33	10	2,155
30	36	9	26	8	79	46	11	33	10	2,370
33	35	10	27	8	80	44	12	34	10	2,640
36	35	10	27	8	80	44	12	34	10	2,880
39	35	10	27	8	80	44	12	34	10	3,120
42	34	9	27	8	78	44	11	35	10	3,275
45	34	7	26	7	74	46	9	35	10	3,330
48	33	5	22	7	67	49	8	33	10	3,215
51	32	3	21	6	62	51	5	34	10	3,160
54	31	0	18	5	54	57	0	33	10	2,915
60 (Adult)	25	0	15	4	44	57	0	33	10	2,610

a lowered resistance to infection, particularly by tuberculosis. On the other hand excessive fat feeding is followed by equally grave disturbances. Approximately as much fat should be given as protein—4 gm. per kilo at one year represents a safe average, 3 gm. at six years and later. That is about 0.3 per cent. of the body weight.

Carbohydrate Requirements for Children.—Average figures are 12 gm. per kilo at one year, decreasing to 9 or 10 gm. at six years, and keeping at this during the period of growth. In healthy children in one group of 100 Holt and his associates found the intake was 10 gm. per kilo, of which 51 per cent. were sugars, including all kinds, and 49 per cent. starch. Owing to its cheapness and also to the fact that more children like sweets there is a present-day tendency to feed too much carbohydrate to children, which results in too low

fat and protein, or both, a tendency to excessive water retention, the disposition of too much fat and dental caries, to say nothing of loss of appetite for proper foods, gastric and intestinal indigestion, and their far-reaching effect on the general nutrition.

Calcium Metabolism in Children on a Mixed Diet.—Holt, Courtney, and Fales found that this is lower than in milk-fed children, averaging on a sufficient intake—*i. e.,* 0.09 gm. per kilo—0.055 gm. per kilo. The best absorption takes place when there is from 0.03 to 0.05 gm. calcium oxid ingested for every gram of fat and when the fat intake exceeds 3 gm. per kilo. Calcium carbonate (chalk mixture) added to the diet increased the absorption, but this did not occur when calcium acetate or calcium phosphate was added. Calcium absorption is low in chronic intestinal indigestion and in active rickets. Cod-liver oil increases the absorption when the calcium and fat intake is sufficient. Vegetable fats used in place of milk fats did not affect the calcium metabolism.

DIET OF SCHOOL CHILDREN

The period usually spoken of as "school days" is an extremely active one physically. The vast number of metabolic changes going on and the growth of the body demand a plentiful and a suitable diet. Both in and out of school and in seminaries careful attention should be given to food, fresh air, and exercise. In other words, the physical development should receive as much attention as the mental growth. In boarding-schools especially the diet should be the subject of careful study, the aim being to avoid monotony and to provide a sufficient and satisfying diet. In many schools the dietary is left to the discretion of the cook. In considering school dietaries several points are worthy of consideration.

Milk, being easily digested in most cases, is of great value, especially for children whose nutrition is below normal. It should be furnished as a beverage daily for breakfast and supper, and is advisable even with dinner. It may also be used in the preparation of puddings and soups. Cream is very valuable, and whenever possible should be supplied in sufficient quantities. A cup of warm milk with bread or crackers is helpful during the middle of the morning and as a substitute for tea in the afternoon. Delicate children and others may with advantage take a glass of warm milk a short time before going to bed. If the rising hour is some time before that set for breakfast, a cup of milk or of bread and milk should be given on rising.

Eggs may be used alone or in the preparation of various dishes. They may be used in almost any way except fried. Fried eggs are apt to be very indigestible. They are often prepared in this way in order to disguise the stale taste of an egg that has been in storage for some time.

Meat is a very important part of the diet, as it contains a larger

quantity of protein, from which the tissues are built up, and in a more available form, than in any other form of food. Milk and eggs are also valuable sources of protein. Meat should be provided, therefore, in sufficient quantities, half pound a day being, perhaps, a good average allowance for a growing boy, the larger and more robust taking that quantity or more, the smaller and more delicate children taking somewhat less. Steak, chops, and roasts of beef, mutton, lamb, fowl, and bacon are the most suitable meats, although pork, together with meat stews, meat puddings, sausage, and hashes, may be allowed in smaller quantities. These last, while generally relished, are not so digestible nor such good sources of nutriment as those first named. With care and proper preparation many of their ill effects can be obviated. More meat is required in winter than in summer, and more in cold climates than in warm. Yeo states that too much meat may give rise to eczema.

Meat may be given twice a day, and eggs or fresh fish may be substituted for it about three times a week. When these do not satisfy the appetite, meat may be added. For this purpose cold sliced meat is useful.

Bread and butter should be given with each meal. Bread made from the whole-wheat flour may be used in the largest quantity, but it is well to supply various kinds of bread, to avoid monotony. "Brown bread" given continuously becomes very tiresome. Rye bread may be given occasionally, and bread made from mixtures of wheat and rye is very palatable. Rusk, biscuit, and crackers may also be supplied. Corn-bread, when properly made, may be given once a week or oftener, and griddle cakes of buckwheat, corn, or wheat flour two or three times a week. These last may be served with syrup or fruit-juices.

Cereal porridges of all kinds may be given for breakfast, oatmeal being probably the most desirable.

Vegetables of almost all varieties may be used. For dinner two varieties should be given, one green vegetable and potatoes. Salads made of the green vegetables, with the very simplest dressings, are useful additions to the diet.

Fruit should invariably be given once a day.

Sugar should be provided for in the dietary. Candies and many of the sweets given to children are harmful and cause indigestion and dyspepsia. If proper sweets were provided, there would be slighter tendency to indulge in the less desirable forms whenever opportunity afforded. With the meals, and when the appetite demands satisfying between meals, they may be given with or without a glass of milk. Regularity should, however, be observed, and they should not be given immediately before or after a meal. Fruit-syrups, sugar syrups, honey, preserved fruits, and jam may be eaten with bread. Caramels, chocolate, maple-sugar, and plain sugar taffies are the best of the other forms of sweets.

Simple desserts, such as custards, milk puddings with rice, tapioca, and the like, bread pudding, plain cakes, and properly prepared pastry may be used.

The beverages should be water and milk. Weak cocoa or chocolate may be given after the seventh year. Tea and coffee should not be given before the thirteenth year, and may be withheld advantageously still longer. Alcohol is not to be used except by a physician's direction.

Especial care should be taken to avoid a monotonous diet, for there are many instances where the constant repetition of a certain form of food has created a dislike for it that has persisted throughout life or been overcome only with difficulty.

A second point to be remembered is that the food should be well prepared and attractively served. This has more to do with influencing the appetite of delicate, nervous children than is generally supposed, and can not be insisted upon too strongly.

Overeating should be avoided, and to this end an older person should always be present when practicable; in school, this should be insisted upon. On the other hand, a child should not, through caprice or habit, be allowed to eat too little. By exercising a little tact, most of the dislikes which are not deeply rooted, but which may become so if persisted in, may generally be overcome. These dislikes are often the result of imitation.

Sufficient time should be allowed not only for the meal, but for the performance of whatever small duties may be required of the child. A time should be set for one or two regular daily visits to the water-closet. Hurrying to school should be avoided. Reading and studying immediately before and after meals should be prohibited, as should bathing or any very active exercise. Some light form of recreation may, however, be indulged in. The hours for meals should be so arranged that the child may have freshly prepared meals, and not cold luncheons or warmed-over dinners. Lastly, nibbling and eating between meals, except under the conditions previously described, should be strictly prohibited. In spite of stringent rules, however, many infringements will occur.

It is by neglect of the diet, fresh air, and exercise that many cases of tuberculosis gain headway; anemia may result from such neglect, and a delicate, nervous child be the outcome of one that should, by right, be healthy.

Very few actual studies of the food requirements of schoolboys have been made. Gephart found that in one of the large boys' school that the quantity taken estimated on the individual *meal* was as follows:

	Pounds.	Grams	Calories.	Calories. (Per cent.)
Protein	0.1107	50.2	203	14 [1]
Fat	0.1332	60.4	562	39
Carbohydrates	0.3717	168.8	692	47

[1] Seventy per cent. of this was in animal protein.

Boys of from 13 to 16 calculated on the basis of complete rest would need from 1700 to 1800 calories. The boy is however a very active animal and his actual food requirements are about equal to a farmer at hard labor (4000 to 4500 calories). Half of the total food values were furnished by bread, butter, milk and sugar. (See Age and Food Requirements.) Du Bois in his studies of boys just before puberty found that they had a heat production 25 per cent. more than adults according to the linear formula which explains the great needs of boys in the period of accelerated growth.

Diet List for a Boys' School.—*Breakfast,* 7.30 A. M.—Half-hour allowed. Fruit. A cereal with cream. Bread and butter, eggs, boiled, poached, or as omelet. Fish occasionally. Corn bread once a week; griddle cakes once a week. Milk to drink.

Dinner, 1 P. M.—Three-quarters hour allowed. Soup; meat—roast-beef or mutton, steak, or chicken; fish once a week; potatoes and a green vegetable. Hominy or rice once a week. A simple dessert; fruit.

Supper, 7 P. M.—Half-hour allowed. Hash, cold meat, fish, or omelet in small quantities. Bread and butter with syrup or preserved fruit or fruit-juice. Plain cake. Milk to drink.

Beginning Cases that Have Been Previously Improperly Fed.—This requires judgment and experience. If the baby has been very much upset, it is a good plan to withhold all food a day or a part of a day. This gives the digestive organs a rest, and often means success where failure would have resulted from feeding almost any food. During the starvation period plain water may be given, or sometimes a little weak barley-water. These latter are useful when anxious parents cannot be persuaded the child will not starve. They may also be used where there is evident hunger. In any case the quantity should be small. We often give an initial purge of castor oil in these cases to insure getting all the food out of the intestine.

A careful study of the stools, of the history of previous feeding, and the symptoms which may be attributed to the feeding or to the disturbances of metabolism. By so doing the diagnosis of the trouble may be made and much valuable time saved by correct therapy. A study of the following facts will be found useful in this connection:

The Infant's Stools.—A very fair conception of the infant's digestion can be obtained from an examination of the stools. This should be done in all cases, and is as important a part of the routine as the examination of the heart or lungs.

The size of the stool should be noted first, although this is not of very great importance, as it varies with the number of stools and the size and peculiarities of the child itself.

The number of stools is always to be considered, but is not nearly so important as the character of the stool. An infant may have one

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or two stools a day, or as many as four, five, or six, but so long as the character of the stool remains good, it may be regarded as perfectly normal. In diarrhea the course of the disease is better told by the quality of the stools than by the number, and this may to a certain extent be said to be true of constipation.

The consistence of the stool of nursing infants should normally be about that of butter, although slight variations either way are not to be regarded as distinctly abnormal. The stool should be smooth, and contain no curds or solid masses. In constipation the stools are hard and dry, while in diarrhea they are soft or liquid.

Lumps are frequently seen in the stool. These are usually curds or masses of undigested fat. They may, however, be clumps of mucus.

Mucus is present normally in the stool, and its presence is easily demonstrated; it should, however, be so intimately mixed with the stool that it can not be seen with the naked eye. Any irritation of the intestinal wall causes a great increase in the amount of mucus in the stool. In diarrhea and in intestinal indigestion there may be large amounts, and in constipation considerable mucus may cover the hard masses of feces.

The reaction of infants' stools is usually acid or neutral, although sometimes it is alkaline. Either acid or alkaline stools may be altered in color. A return to a normal color is usually brought about in these cases by the administration of an alkali when the stools are acid, and *vice versa.* Alkaline stools, green in color, may be produced by giving alkalis in large doses for several days. The color of the stool often furnishes considerable information as to the condition of the infant. Normally the color is a light butter yellow, but the stools may vary somewhat in this respect, and be lighter or darker. In young breast-fed infants the stools may be a dark yellow, like the yolk of an egg. In artificially fed babies the stools are apt to be very light in color or even decidedly whitish. Rhubarb imparts a yellow color to the stool.

White stools are seen sometimes in artificially fed children that seem to be otherwise in normal condition. As a rule, however, white stools are either the result of the ingestion of excessive quantities of fat or indicate an absence of bile. In the former cases the stools are large, whitish, and have the characteristic odor of fatty acids, which resembles that of rancid butter. The stool may be dried and burnt with the same odor and the fat may be dissolved by ether. When bile is absent, the stools are white and have a very foul, almost cadaveric, odor.

Red stools may owe their color to the presence of fresh blood from the rectum or the lower part of the intestinal tract. When it comes from the upper parts, the blood is always black. The streaks of fresh blood frequently seen where hard stools are passed come from slight excoriations of the anus.

Black stools are caused by the presence of blood. In this case the stools are black and tarry. The blood may come from the intestines or stomach, or from blood swallowed, especially that from hemorrhage from the posterior nares.

Black or blackish-brown stools may also be caused by the administration of bismuth, iron, tannic acid, argyrol, or charcoal. Black mucus stools are also seen in starvation. *Brown stools* are frequently seen as the result of bacterial and chemic changes in the intestine in the course of intestinal indigestion and intestinal infection. Brown stools are also seen in children fed on maltose preparations, as dextri-maltose, Mellin's food, malt soup, malted milk, and the like. Raw beef-juice may give rise to foul-smelling brownish- or grayish-colored stools.

Green stools are due to a large number of causes. This may result from intestinal indigestion and infection due to improper food, usually either an excess of sugar or of fat, or to the presence of bacteria. Calomel causes green stools, and alkalis, if continued and not neutralized in the intestine, may produce the same effect. (See also Finkelstein's classification.)

Pink stools are due either to urates from the urine or from changes in the bile-pigments, or occasionally if the stool is alkaline and phenolphthalein has been given as a purgative.

Stools With Curds.—These contain undigested fat or protein, or both. Fat curds are commonest and give characteristic reactions where tested for fat. Protein curds are apt to be larger and harder. Ether dissolves the fat, but hardens the protein curds. Curds may occur from indigestion due to excessive amounts of sugar or carbohydrate. Soap stools are seen in babies taking moderate or large amounts of fat, large amounts of calcium and casein (as protein milk and similar preparations), and where the carbohydrate is low. These stools are large, light gray, somewhat crumbly, and they do not adhere to the napkin.

Starch Stools.—Undigested starch may cause loose, brownish stools which cause excoriations of the buttocks. They have a moderately bad odor and may at times look more or less normal. The starch granules show on microscopic examination and give the iodin reaction. If fermentation is present a large, mushy stool of churned appearance is the result. The color varies (whitish, grayish, or greenish), but the odor is always most foul. Gas bubbles may be seen.

Symptoms of Dietetic Errors.—Too much stress can not be laid upon the importance of investigating the source of disturbances due to dietetic errors. There is ample room for further clinical study on this subject.

Too Low Protein.—The stools are small and constipated, if the other food elements are low, as they are apt to be. The child does not gain weight so rapidly as a normal child, or it may remain stationary

or even lose weight. It is anemic, and if the low protein is continued, the child becomes marantic.

Too High Protein.—The child is apt to have colic, vomiting any time, but usually half an hour or more after feeding. The stools contain undigested curds, and mucus, and may be yellowish green or otherwise discolored.

Too Low Sugar.—The gain in weight is apt to be slow, and the child may be constipated. These infants are usually thin.

Too High Sugar.—Vomiting an hour or two after meals, the vomited matter usually being sour. Acid eructations are common. Colic is frequent. The stools are generally grass green and very irritating, the buttocks often being excoriated.

Too Low Fat.—The child gains weight slowly, and is apt to be constipated unless an excess of sugar is given, as in condensed-milk feeding.

Too High Fat.—The child vomits an hour or two after feeding. Colic is common. The stools may be thin and green or greenish yellow, and contain small masses of undigested fat and considerable mucus. These small lumps are often mistaken for curds. They are more or less translucent, and when burnt give off the odor of fatty acids; they may be dissolved in ether. Curds are not, however, dissolved in ether. Another type more common is the large, white, rather dry stools having the odor of rancid butter.

It must be remembered that the condition of the stools may be due to one or more of the food elements, and experience in these cases, as in most others, is the best teacher. It is only by practice and careful observation that the feeding of infants may be conducted properly. Another fact to be remembered is that the food need not be changed to meet every trifling alteration in the temper of the child or in the character of its stools.

OTHER FACTORS IN INFANT FEEDING

Institutional Care of Infants.—Chapin condemns institutional care and thinks all infant asylums should be closed. Alfred Hess, in New York, however, reports results equal to those obtained in private practice. Brady (Archives of Pediatrics, 1917, 34, 356) reports a mortality under 10 per cent. He suggests the use of two simple formulas. The first contains 11 calories to the ounce; the young infant receives 4 ounces of this mixture for every pound of body weight as soon as it will take it. The average baby at three or four days takes 1 ounce; at eight days, 1 to 2 ounces; at fourteen days, 1½ to 2 ounces; at three weeks, 2 ounces; at six weeks, 3 ounces; at eight weeks, 4 ounces. On reaching a weight of 8½ to 9 pounds they are given Formula No. 2, which contains 18 calories to the ounce, and 3 ounces of this are allowed for each pound of body weight.

Formula No. 1

¾ quart skimmed milk
¼ quart barley-water (thick)
1 ounce (by measure) Mellin's Food
½ ounce granulated sugar

Formula No. 2

⅔ quart whole milk
⅓ quart barley-water (thick)
1 ounce granulated sugar.

As a rule the milk is acidified with lactic acid bacilli twelve hours before being made up, having first agitated it.

Citrated milk, as suggested under that heading, is also useful.

Finkelstein's Classification.—An outline of this is included, as it is much talked about at present. The chief value of his work seems to us to be the use of albumin milk, the recognition of food intolerance, and that some of the conditions which have been regarded as merely gastric or intestinal are more deep seated.

He separates four classes:

1. Disturbed metabolic balance (Bilanz Storung).
2. Dyspepsia.
3. Intoxication.
4. Decomposition (acute atrophy).

1. In the case of **disturbed metabolic balance** the condition is what we describe as a mild case of marasmus. There may be a congenital idiosyncrasy in regard to milk, or there may have been improper feeding, especially too high fat. The symptoms are either no gain in weight or an irregular increase below normal, in spite of the fact that the infant is getting what should be sufficient or even more than sufficient food. There is a wider range of temperature than normal, especially marked in infants under six months, and also where the tolerance for carbohydrate is disturbed. The stools are gray or white, dry and friable if too much milk has been given, and they are green and thin if excessive carbohydrate has been given. Vomiting is frequent and there is tympanites. The muscles are soft and flabby and the skin pale. The child is restless and irritable and sleeps poorly, and irritation and infection of the skin common.

In these cases the protein digestion and retention are normal. The disturbance is due to fat, carbohydrate, or salts causing an abnormal reaction.

The treatment of these cases is best accomplished by human milk. Where this is not possible, skimmed milk feeding or buttermilk is often useful. If ordinary milk mixtures are used, the fats may be decreased and an increase made in the carbohydrates. Sometimes changing the form of sugar that is used is of value. Malted foods or malted milk added to the milk may be of value.

2. **Dyspepsia.**—This represents the second degree of severity, and there are acute gastric intestinal symptoms. These cases are due to a

congenital lowered tolerance to cows' milk, to errors in diet, either too much food or too much of some one element. Feeding with infected milk and infectious diseases, either general or local, may be the primary cause.

Finkelstein believes that sugar, salts, and fat are the exciting causes, and advises giving human milk when possible. If this is not available, in the mild cases reduce the milk and sugar, and in the severe cases reduce sugar, whey, and fats. First, starve a day and then give buttermilk or one-third boiled milk and two-thirds thin oatmeal gruel. It is in these cases that albumin milk is especially indicated. (See above.)

3. **Intoxication.**—These cases are what we call gastro-enteritis, summer diarrhea, or cholera infantum. They are due to food intolerance, to infected food, or to heat. Finkelstein believes that infants in which the diet has been rich in sugar and whey will have an intoxication, while those fed on a diet rich in fat and low in sugar will have decomposition or atrophy; that is, his fourth class of cases.

The symptoms of this intoxication class are what we call summer diarrhea. The treatment of these cases, according to Finkelstein, is to starve a day or two, but give sufficient water. Subcutaneous salt solution infusions in the more severe cases are of value, or salines per rectum by the drop method may be used. Stimulants and sedatives are used as indicated. Human milk should be given if possible, and if it is not, a diet low in fat and sugar. Albumin, milk, beginning with very small quantities, may be used. After the starvation day give ten feedings a day of 5 c.c. of albumin milk, and then increase 50 c.c. a day until the stools are improved, and then 100 c.c. a day until 180 to 200 c.c. are given daily for each kilo of weight. After the stools are solid, add 1 per cent. sugar and increase gradually to 4 per cent. The total feeding should not exceed 1000 c.c. of albumin milk daily.

4. The **decomposition or atrophy** cases are characterized by a lack of ability to assimilate food. There is a subnormal, irregular temperature, weak pulse, irregular respiration, and rapid loss of weight. There is usually great hunger, often vomiting, and the stools are usually abnormal. Feeding with human milk is almost an essential to successful treatment. If it is not available, buttermilk or albumin milk, with the addition of maltose, may be used.

The Feeding of Difficult Cases.—The feeding of certain infants often becomes a difficult matter, not so much on account of actual conditions of disease, as owing to personal idiosyncrasy. Others again are difficult to feed because of actual disease of the digestive organs or on account of the lowering of nutrition due to the existence of other diseases. These cases will be considered in proper order.

At the outset it must be remembered that the fault may not be due to the food itself, but to its preparation or the mode or time of ad-

ministration, and to improper surroundings and care. To succeed in these difficult cases it is necessary to look diligently into the minutest details of the infant's life.

Loss of Weight.—Loss of weight in an infant should always be considered a very serious symptom. During an acute illness, such as pneumonia or diarrhea, this is to be expected. In chronic conditions the weight may fluctuate, going up and down, or remaining more or less stationary. If, however, in a period of a month or two there is no general tendency to gain, in spite of the fluctuation, this indication is a serious matter. Where an infant is losing weight without any special cause, this may be attributed to insufficient food. If the infant is nursing, the breast milk may be poor or insufficient, or both. If the babe is bottle-fed, the milk may not have been increased in strength in proportion to the child's growth.

It frequently happens that difficulty is experienced in obtaining a food suited to an infant's digestion. This end, however, once attained, the physician may increase the quantity, but not the quality, of the food, and the infant finally ceases to increase in weight, remains stationary, and then loses. Loss of weight may also be due to a food too rich in proteins or to one unsuited to the infant's digestion. This latter cause usually, but not always, gives rise to other symptoms.

In all cases a careful study of the food is essential. Accurate charts of the quantity of food taken, the time, whether the child vomits and at what time, and the number and character of the stools, etc., are of great help. If the food is increased or decreased, as the case may be, to an average strength for a child of the size and weight of the one under consideration, and there is then no change in the child's condition, the food should be peptonized, either partially or completely, or mixed with an albuminized or malted food or with barley-water. Milk mixtures high in protein and carbohydrate and low in fat are useful as are also malt soup preparations. Condensed milk with soy and barley gruel we have found of especial value. Loss of weight may be caused by persistent vomiting (see Vomiting).

The physiologic loss that occurs during the first forty-eight hours of life should not be forgotten.

Stationary Weight.—This frequently follows when an infant is weaned or when one is fed artificially from the outset. Even if the child is receiving correct percentage of food it may not gain for several weeks. So long as the infant is well and the percentage and quantity given correspond to those directed for an infant of the same age and weight, no alarm need be felt, even if a month should elapse without showing increase in weight. However, once the regular gain in weight is established, it should not remain stationary, but should increase gradually from week to week. The average weekly gain during the first year of life is between four and eight ounces. The weight may occasionally, without any apparent assignable cause, be the

same at one weekly weighing as it was at the preceding one. If this persists, a careful search for the cause must be made, and will often be found to be insufficient food.

Importance of Vitamin A in Infant Feeding.—If a baby is not gaining, the food should be studied with reference to its approximate content of vitamin A, and the lack corrected. Plain or phosphorized cod-liver oil (gr. $\frac{1}{25}$ to the ounce) may be administered to advantage. Pregnant and nursing mothers should have sufficient vitamin A containing foods, and cod-liver oil may be used if there has been a deficiency.

Colic.—This is more apt to occur in the breast fed than the bottle fed if the food is properly adjusted to the child. It is most common the first three months. If the child is gaining it should not be weaned on account of colic. Colic may be present if the mother menstruates. Many times the crying is due to habit or as a result of uncomfortable surroundings. An overnervous, excitable mother may be the cause. In the bottle fed see that it is neither overfed nor underfed; that the amounts of fat, protein, and sugar are correct. If constipation is present, arrange the diet accordingly. Changing the character of the milk may be necessary. Liquid or dry cultures of the lactic acid bacillus may be given three times a day with or without calcium caseinate. The calcium caseinate is prepared by adding $\frac{1}{3}$ ounce to 10 ounces of water, making a paste first, the water added, and brought to a boil. One ounce of this is given before the breast feeding.

Vomiting.—*Immediately after Feeding.*—(*a*) From the food being given in too large quantities. Reduce quantity.

(*b*) From food being given too dilute, and so necessitating the taking of too large quantities. Reduce the quantity and increase the strength.

(*c*) From taking food too rapidly. Give more slowly—in breast-fed children, by regulating the flow by grasping the nipple between the fingers; in bottle-fed babies by using a nipple with a smaller hole.

At any Time.—Due to the abdominal binder being too tight, or to shaking or holding the infant with the head over the nurse's shoulder, patting on the back, etc. From too high proteins—this is more apt to be accompanied by other symptoms, as colic, curds in stools, etc.

One or Two Hours after Feeding.—The vomited material is usually sour and curdled, or it may be watery and contain mucus. This is due to the percentage of fat or sugar being too high. The fat, or both fat and sugar, should be decreased, and the food be given slowly and at longer intervals.

Vomiting also occurs in many diseased conditions. Pylorospasm is a frequent cause, and pyloric stenosis must be borne in mind, as should nervous or habit vomiting. It is a frequent accompaniment of gastric and intestinal disorders, infection, and all

acute diseases; it occurs in nervous diseases, such as meningitis, and in brain tumor, in peritonitis, and in intestinal obstruction, with coughing spells, as a habit, or reflexly from intestinal or pharyngeal irritation, or in toxic conditions, such as uremia. The treatment depends on removal of the cause where possible. When it occurs in ordinary acute diseases, however, much can be done in a general way to overcome vomiting. The food should be given in sufficiently small quantities at two-hour intervals, or in some cases a teaspoonful of food may be given every hour, or even every half-hour where larger quantities are not retained. If the case is acute, it may be necessary to secure a wet-nurse (see Inanition). Washing out the stomach and gavage are two very important means of treating persistent vomiting which should not be forgotten.

GAVAGE

Gavage, or feeding by means of a stomach-tube, is a method used in various diseases and conditions of infancy and childhood. In cases where the child is not able to take nourishment, or only in insufficient amount, and in cases of uncontrollable vomiting, this method may be resorted to. It is used in the feeding of premature infants, whether in an incubator or not, and in cases of small, weak, marantic infants who, owing to weakness or lack of appetite, do not take sufficient nourishment. It is also employed after surgical operations about the head or neck where swallowing is interfered with, and in acute diseases, such as pneumonia, in fevers, and in delirium or coma.

The results that follow this method of feeding are surprising, especially in cases where there is constant vomiting or where the stomach has a very small capacity. In the former case the vomiting may cease and the food be retained; in the latter, the capacity of a stomach that previously held only an ounce or two may rapidly be increased until an average-sized feeding is retained with ease.

The technic of the method is simple, and the procedure conducted without difficulty in children under one year of age; above that age it may be difficult, and a mouth-gag may be required; in some cases nasal feeding must be substituted. The apparatus employed is the same that is used for washing out the stomach, and since it is frequently desirable to wash out the stomach before introducing the meal, the same tubing may serve for both purposes. It consists of a soft-rubber catheter connected, by means of a piece of glass tubing, to a piece of rubber tubing to the other end of which a funnel is attached. The nurse holds the child on her lap, with the head held straight and not inclined in either direction. The catheter is moistened with warm water and held several inches from the end, so as to allow enough of it to pass into the esophagus with the first attempt at introduction. The mouth is opened, if necessary, and the catheter passed rapidly into the pharynx; there is usually a swallowing move-

ment, and the tube is readily passed into the stomach. If the procedure is carried on too slowly, the tongue may interfere, or if the catheter is held too near the end, it may cause gagging. Before introducing the food it is well to wash out the stomach with normal salt solution. As soon as all the food has entered the stomach, the catheter is pinched and rapidly withdrawn. If it is withdrawn slowly, the food may come up with the tube. If the catheter is left open as it is withdrawn, the dripping into the pharynx may cause vomiting. If the child is young, it is a good plan to keep the finger between the jaws for a few moments to prevent gagging. If the food comes up, the feeding must be repeated.

Nasal Feeding.—For this purpose a catheter in proportion to the size of the child should be used. The procedure is the same as that for adults. (See Forced Feeding.)

DIET IN DISEASES OF CHILDREN

Cyclic Vomiting.—This is a curious derangement of metabolism, in which there is an acidosis that may have been started in one or several ways. In addition to the acid poisoning, there is said to be a disturbance in the ratio of the excretion of uric acid to urea. During the attack it is well to give the stomach absolute rest, as food and drink tend to aggravate the condition. Glucose solutions should be administered as outlined for acidosis. The soda is useful in combating the acidosis and the glucose furnishes a carbohydrate which is extremely useful in establishing a normal metabolism in the acid conditions. If the attack is prolonged, additional rectal feeding may be given. Small doses of atropin administered by stomach is sometimes useful. When the vomiting stops, it is best to have rest for some hours before the feeding is resumed. For the first day of mouth feeding, milk to which lime-water has been added, or skimmed milk with 3 grains of citrate of soda added to each ounce, peptonized milk, albumin-water, or barley-water may be used. After three or four days a return is made to the ordinary diet. As a rule, when the attack is over, convalescence is rapid. (See also Acidosis.)

The diet in the interval is important and requires considerable study to adapt it to the particular child, but much can be done to lengthen the interval between the attacks. It is also important to have the child out of doors as much as possible, as much exercise as can be given, but carefully avoiding fatigue. All sorts of nervous excitement must be avoided. The diet should be so planned as to allow an excess of alkalis (See Alkalis and Acids), and this is usually easily done. Lean meats, eggs, milk, potatoes, green vegetables and fruits generally must furnish the bulk of the diet, but cereals and bread stuffs should be allowed in moderation. The fats should, as a rule, be low.

Some cases seem to show a close relation to the carbohydrate intake and in starvation or in the absence of carbohydrates, attacks may be

precipitated or if the carbohydrate is insufficient in amount the attacks may be more frequent. In some cases the fats are in excess or the balance between the fats and carbohydrates is at fault and can be helped by lowering the fat intake. In some cases the overuse of sugar seems to be the fault and the acidosis may be connected with abnormal chemical changes in the bowel. Cutting out the sugar (not all the carbohydrates) will be of great service. We are of the opinion, after a considerable experience, that the interval between the attacks can be lengthened if the case is thoroughly studied and the coöperation of the family secured.

A saline purge at intervals of from one week to a month seems to be of value and the administration of sodium bicarbonate from time to time should be tried. Célestins vichy is a pleasant way of furnishing additional alkalis.

Stomatitis.—In stomatitis the feeding often becomes a matter of great importance. In the milder forms there is not much difficulty in getting the child to take liquid nourishment, especially if it is given cold. In the severer forms, such as ulcerative stomatitis, the child may refuse all food. In these cases it should be offered food in the form of ice-cold milk, albumin-water, and the like. If all food is refused, or if insufficient quantities are taken, rectal feeding must be instituted. In some cases nasal feeding may be resorted to, but in many patients where this is indicated it can not be employed because of the inflammation extending into the nares. In all cases the diet should be similar to that used in scurvy. Fresh fruit-juices and vegetables are to be given. In the ulcerative cases chlorate of potassium or mineral acids are useful.

Acute Gastric Indigestion—Acute Gastritis.—As these diseases can not, as a rule, be distinguished from each other at the outset, and since the dietetic indications are along similar lines, they may, for convenience, be considered together.

The main indications are to empty the stomach and to give it rest. If possible, it should be cleansed by washing with a tube and an abundance of warm water; where this is not possible, warm water may be given to drink, and, if necessary, vomiting induced.

Food should be discontinued entirely for six hours, and during this interval small quantities of hot water may be given. At the end of this time, if the vomiting has ceased, small amounts—1 to 3 ounces—of barley-water may be administered. Milk in any form should be withheld for twenty-four hours, when, if the baby is breast-fed, it may be nursed for a few minutes at three-hour intervals. If this is found to agree with the child, the time of nursing may be lengthened and the intervals between feedings shortened. If the baby is bottle-fed, it is well to withhold cows' milk, and to give barley-water or rice-water in its stead; when the stomach has become tolerant, other articles may be added. At first broths, free from fat, and meat-juice may be tried, followed by malted milk. Only small quantities should

be given at first, and at intervals of three or four hours. As improvement occurs the food may be given oftener and in increasing quantities. For the younger infants and for older infants if the stomach is at all irritable, it is well to peptonize the cows' milk when it is first given. For older infants a small amount of milk may be added to a large quantity of a cereal water, such as barley-water. It may be well to boil the two together for a few minutes. The amount of milk may gradually be increased, an equal volume of lime-water being added to it at first. If the stomach is very irritable, small doses of hot water frequently repeated may be tried, or, what is usually of greater service, teaspoonful doses of equal parts of lime-water and cinnamon-water.

Dilatation of the Stomach.—The methods of diagnosing and treatment of this condition are similar to those when the disease occurs in adults. The essentials of the treatment are stomach-washing, small meals at sufficiently long intervals, and tonics, such as strychnin and nux vomica. The character of the food should be about the same as that advised for chronic gastritis.

Rumination, where the food is regurgitated and then swallowed again, is not uncommon in nervous infants and even in older children; it may be accompanied by facial grimaces or chewing movements. More or less of the regurgitated food is lost, so that emaciation is the rule. Changing the character of the food often helps, and thick gruels made with milk and cereals may be retained where thinner foods are lost. Sometimes merely changing to a different milk, as goat's milk or dried milk, will effect a cure. Some recommend an apparatus to hold the head so that regurgitation is difficult, but we have never resorted to this. Restraining the hands so that they cannot be put in the mouth is important in some children, and tying the strings of a cap under the chin tight enough to keep the mouth shut or a bandage under the chin and tied over the head may be useful.

Pylorospasm is a frequent cause of vomiting, and must be differentiated from congenital hypertrophic stenosis as far as the clinical picture is concerned, but the symptoms are usually but not always less severe, and the onset may be later. In our experience the administration of atropin before the feeding works miracles. Remember, it may be due to overfeeding. In addition to atropin, washing out of the stomach is of great value. Human milk is the food of choice, but the feeding of milk and cereal gruels may be of great service, as are the dried milks. Alkalinized milk, particularly by the addition of sodium citrate, is also advised. Peptonized milk and buttermilk mixtures may be useful. Refeeding, if much of the food is lost, should be done to prevent loss of weight, and giving smaller feedings at shorter intervals may help.

Hypertrophic pyloric stenosis usually comes on in the third or fourth weeks of life. There is projectile vomiting, constipation, rapid

emaciation, gastric peristalsis is plainly visible, and the enlarged pylorus may often be felt. If the abdomen is tense, give the child a bottle to suck to facilitate the examination. As soon as the diagnosis is certain the Rammstedt operation should be done. If there is any doubt, try atropin first.

An hour after the operation the child should be given a teaspoonful of water providing it has sufficiently recovered from the anesthetic; an hour later a teaspoonful of breast milk mixed with a half-teaspoonful of water. Water in small quantities may be given midway between the milk feedings, which may be offered every three hours. The size of the feedings may be increased gradually and the milk given undiluted after the first twenty-four hours. The size of the feeding may be increased one teaspoonful each time. This is a good average rule, but the increases may have to be made more slowly, and sometimes it may be advisable to increase more rapidly. The full feedings for the child's weight should be reached in from three to five days.

If there is a tendency to vomiting, glucose solution may be given by the Murphy drip method, not over 12 drops to the minute. Mothers' milk (which at first has the cream removed) is the best food, but mixtures of skimmed milk and water to which 3 grains of sodium citrate has been added to each ounce may be used. Peptonized milk is also useful. Meat juices have been suggested, but milk feeding is probably better.

Diarrhea in Infants.—Diarrhea is an old-fashioned term for which many substitutes have been suggested, but up to the present no great amount of light has been thrown upon the subject by changing the name. Before undertaking the treatment of a diarrhea the physician should have a pretty clear idea of what he is to deal with. Some cases are simple, are due to drugs, to laxative fruits, or gross errors in diet. Other cases seem to be caused by thermic influences, heat or cold, but usually extreme heat. Some cases are reflex, or are due to general or local diseases not directly connected with the digestive tract. Some are due to protozoa or other forms of animal parasites, some to food intolerance, from feeding too much of one food or too much sugar. The greatest number of cases, however, are due to impure milk and are due either to bacteria or toxins which have been formed in the milk. In some instances this may be due to some specific bacteria, such as a dysentery bacillus or a streptococcus infection or other definite pathogenic bacteria.

We try to classify the cases clinically as regards feeding into: (1) simple diarrheas where there are no serious local or general disturbances, although some of these cases may present alarming symptoms; (2) intestinal intoxications and infections, where there is the added element of either a toxin or a pathologic bacteria, and (3) cases in which there is more or less disturbance due to food intolerance and where there may be a marked derangement in metabolism.

It is well to remember that the diagnosis of these present unusual difficulties at times. One cannot, as a rule, tell whether the diarrhea is simple, infectious, or a food intolerance, although with experience one may at times make the diagnosis at the start. A diarrhea in a child fed on the breast alone is generally simple. A diarrhea in a bottle-fed child when the mean temperature is around 80° F. and the humidity high is usually an intoxication or an infection. The cases due to food intolerance have the history of stationary weight with or without some digestive disturbance, or there have been symptoms referable to overfeeding of fat or sugar or of an intolerance for one or the other. Feeding with too high fat and too high sugar at the same time is more liable to cause the trouble than when one element alone is too high. There is usually no especial intolerance to protein unless the normal limit has been considerably exceeded.

Over 95 per cent. of the cases and of the deaths are in breast-fed babies, and the greatest proportion of these occur in very hot weather. The sexes are effected about equally, but age is a big factor, and most of the severe diarrheas occur during the first two years.

The Diet in Simple Acute Diarrheas.—In the breast-fed baby an initial purge, preferably of castor oil and plain water until the bowel has been emptied, is usually all that is required. If there is vomiting the breast may be withheld until the stomach is quiet. Washing out the stomach in these cases usually stops the vomiting. A little water before feedings to dilute the milk in the stomach and the shortening of the time the child is at the breast to one-quarter or one-half for a day or two is usually all that is required. In the bottle fed and partly bottle fed one cannot tell at the onset what the nature of the disease is going to be. It is, therefore, important to have the diet meet any emergency. Stop all food of any kind and give a dose of castor oil or, if that is vomited, of calomel. A tenth of a grain every twenty minutes for ten doses is usually effective. Smaller doses may be used in young infants. Salines may be used if preferred. For twenty-four hours nothing except plain water should be given or, at most, a little thin barley-water or a little weak tea, except in babies who are to be fed on protein milk or one of its modifications or on calcium caseinate milk. In the partly breast-fed babies who are manifestly not ill a little breast milk may be allowed if there is no vomiting. If there is any doubt, starve the child for the first twenty-four hours. At this point we wish to remind our readers that we refer to acute diarrheas in children whose stools appear to be normal. We have seen babies suffering from mild, chronic, intestinal indigestion given the most heroic treatment, which they did not require.

After twenty-four hours, if vomiting continues, the stomach should be washed out with a solution of bicarbonate of soda, 1 dram to the pint. If there are toxic symptoms in the onset it may be well to wash out the bowel as well, unless there is free purgation.

The type of diarrhea has to be considered, particularly in the bottle fed. From a dietetic standpoint most of the cases will be found to come into one or two groups, those who do well on protein milk or some of its modifications and those who do well on feedings high in carbohydrates. Where there is fermentation with the formation of considerable amount of gas the former feeding is to be preferred. Where there is putrefaction or the splitting of proteins and vile-smelling stools, like odor of rotten meat, with or without gas, the high carbohydrate foods should be chosen. It is impossible at the present time to be perfectly certain with which type of the disease one has to do, but usually after a trial of one or other food the further management of the case becomes plain. It should be borne in mind that in all diarrheas that children do better on either fat-free foods or foods relatively low in fat. In feeding with protein milk or one of its modifications the reader should read what has been said about these milks and their preparation in another place in this volume. On account of the simplicity of preparation we usually prefer a home-made calcium caseinate milk, and good results are obtained in most cases, but in cities where protein milk may be bought it sometimes will give relief where other preparations do not. The use of powdered protein milk can also be recommended providing it is fresh. If these foods are not at hand, old-fashioned buttermilk, that is, milk left after churning butter, or skimmed milk which has been soured by adding the proper starter, may be used instead, with excellent results. Another food which is very useful is the soured whole milk, the method of preparation of which is given in another place under the heading of An Old Dutch Method. In addition to this the milks which have been soured with the addition of the Bacillus acidophilus may be used. No matter which one of these is chosen, the procedure should be the same. The child should be given very small quantities, which should be gradually increased. If there is vomiting, the first feeding may be a teaspoonful or less. If there is no vomiting, one usually begins with ½ ounce in younger children, increasing each feeding from 2 grams to ½ ounce, until the normal size feeding is reached, and, if older children, increasing an ounce each time in the same way. On this diet the stools should become less frequent, less watery and contain less mucus, should become pasty, and usually within forty-eight to seventy-two hours sufficiently hard not to adhere to the napkin, but if the stools are smooth and digested, whether this takes place or not is not so important. When this change has taken place in the stools some form of carbohydrates should be added to increase the caloric value of the food, which, it should be remembered, in most instances is a starvation diet. Dextrimaltose or some similar preparation may be added, beginning with small quantities, about 1 per cent., and this may be increased to the normal amount, adding more each day, and after the first day or two in older infants barley gruel may be used

in place of plain water, or barley flour cooked and added to the protein milk. The fuel value of the milk may be increased by the addition of gelatin, ½ teaspoonful to the day's feeding in infants under six months, and 1 teaspoonful in those over six months. It should be soaked in a little water or milk and then dissolved in hot water and added to the milk. After the stools have been normal for a week or more the child may gradually be returned to its usual diet. Great care is needed in making the change, as the diarrhea may be started up again by injudicious feedings.

In the other type of cases mentioned above carbohydrate feedings should be started. Some prefer dextrimaltose or some similar preparation, 1 level tablespoonful to 4 ounces of water, and starting with a teaspoonful and increasing the amount, eventually adding skimmed boiled milk to the mixture. We usually prefer starting with the barley-water, using 1 level tablespoonful of barley flour to a pint of water and a pinch of salt, and it is not amiss to add gelatin to this, as stated above. The sweetened condensed milks are generally used with good results, starting with 1 teaspoonful to 2 ounces of boiled water and increasing to the strength of 1 teaspoonful to 1 ounce of boiled water. Malted milk is sometimes useful in the strength of 1 level teaspoonful to 1 ounce. Where the infant is losing fluid rapidly and vomiting continuously, it is very important to supply fluid. This is best done by giving normal salt solution subcutaneously, intraperitoneally, or intravenously. Sometimes soda and glucose solutions are used in the manner suggested for acidosis (see Acidosis). In very acute cases, with tremendous loss of weight and symptoms of intoxication, human milk is of great service and should be insisted upon.

Diarrhea in Older Children.—When diarrhea occurs in older children, the early dietetic treatment is similar to that recommended for infants. As the child recovers a return to the ordinary diet may be made, meat, eggs, and broths of various kinds being given at first, followed by boiled milk and toast or dry bread. Vegetables and fruits should be given only after recovery is complete, and their effect should carefully be watched. Cereals may also cause a recurrence of the trouble, and should be most thoroughly cooked and given in small quantities at first.

Ileocolitis.—This term is used to include those bowel conditions in which there are serious lesions in the intestine. The disease usually follows a summer diarrhea. The dividing-line between the two is hard to draw, and it is very probable that ileocolitis is merely a severe form of infection with the Shiga-Flexner bacillus or other bacteria. The term dysentery is also frequently applied to this affection. Conditions resembling this disease may come on in the course of chronic disorders.

The feeding of these cases is a difficult problem. In general the

diet is similar to that given in diarrhea. As all nourishment is usually refused, however, when the disease is protracted, as it is apt to be, it is extremely difficult to sustain the child, and the skill and tact of both nurse and physician are tested to the utmost.

In the acute cases, when there is vomiting, it is a good plan to withhold all food for the first day or two. Water may be given in small quantities, and stimulants if necessary. Washing out the stomach frequently allays the vomiting. This is best done with a tube, but in older children it is apt to cause excitement and does more harm than good. With younger children the process is easily carried out. A glass of warm water will sometimes accomplish the same purpose. Often a cup of hot water sipped slowly will relieve the nausea. Equal parts of lime-water and cinnamon-water form a mixture that is very useful for irritable stomach.

The acute stage of this condition is managed in older children much in the same way as suggested for younger infants. Where there is very marked toxemia, feeding with human milk is imperative and often gives relief where the child would otherwise die. The return to the regular diet should be made slowly, but at the same time it should be borne in mind that the child needs food and that many cases of diarrhea die of starvation.

Chronic Ileocolitis.—The dietary of a child with this disease is not easily constructed. The foods directed for acute cases are all useful, and a dietary can be formulated from them. The effect of any food on the stools should be watched, but observations should not be made in the presence of the patient, as children of four years or more may become very morbid from watching frequent examinations of their stools.

The predigested foods, such as the beef preparations, peptonized milk, and the like, are among the most valuable articles of diet in these cases, but barley- or rice-gruel, with or without milk, and eggs may also be used. Malted milk and the malted foods are of service at times. Alcohol, in the form of whisky, brandy, port or sherry, and in whatever shape it is most palatable, may be given.

Inunctions with cocoanut oil or cocoa-butter are useful in promoting nutrition. A change of air is often followed by excellent results.

Chronic Intestinal Indigestion.—Under this head may be included the ordinary form of chronic intestinal indigestion, as well as such special forms as starch indigestion and the so-called mucous disease.

Where the coöperation of the mother or nurse can be secured, the results of treatment are very satisfactory. If the diet can not be controlled absolutely, it is difficult or impossible to accomplish much in these cases.

Chronic intestinal indigestion occurs at all ages. In young infants it is frequently due to improper feeding, and disappears when the

child is put upon a proper diet. It may be seen in both breast-fed and bottle-fed babies. In breast-fed infants it is frequently caused by an over-rich milk, in which case a simpler diet for the mother with exercise out of doors will be all that is required. (See Management of Nursing Mothers.) In other instances, where the mother has been taking various articles in order to increase the flow of milk, a return to a proper régimen brings relief. In still other cases the child is nursed too often or too long. The disease may come on as the result of allowing the child to sleep all night at its mother's breast, with the consequent frequent and irregular night feedings. In another troublesome class of cases no cause can be made out. In these, if the condition persists and the child's general health is affected, weaning should be considered; when, however, the child continues to thrive and the condition can not be relieved, nursing may be allowed to continue; frequently these cases recover in a short time.

When the disease occurs in bottle-fed babies, the child has usually been given, for a considerable period, a food too high in one or more of the food elements. (This subject has been discussed under Infant Feeding, to which section the reader is referred.) Another frequent cause in bottle-fed babies is the use of a proprietary food unsuited to the age or condition of the child, or the use of improper articles of diet, especially starches and sugars.

Sugar and starchy food in excessive quantities is a factor in the causation of this disease that is often overlooked. Careful questioning frequently brings out the fact that sweets of various kinds have been given to the infant by indulgent parents or friends. Periodic attacks of vomiting and pain or of malaise and discomfort, analogous to the bilious attacks of older individuals, may usually be relieved by reducing the carbohydrates to a minimum. These attacks are occasionally so severe and misleading as to give rise to the diagnosis of malaria, tuberculosis, typhoid fever, and many other diseases, even by competent physicians. In almost every instance a complete cure can be quickly brought about by dietetic means alone.

Between one year and eighteen months it is common for mothers to desire to increase the diet of their children. Milk should always form the basis of the diet, and if other articles disagree, a diet of milk and broths exclusively may bring about a state of perfect comfort.

In Older Children.—The management of these cases is, as a rule, quite satisfactory. They require individual study, however, for in one case the fat may be the cause of the trouble, in another it may be the curd in the milk, and in still another the carbohydrates may be the disturbing element. The diet should aim to give the intestine as little work to do as possible. To this end, the carbohydrates should be discontinued altogether at first; and when they are begun again, it should be cautiously, and the effect should be carefully watched.

The fats should be greatly reduced or even omitted altogether. Protein should be given in as digestible a form as possible, and peptonized if it causes indigestion.

In severe cases the child may be fed upon peptonized skim-milk. This may be completely or partially peptonized, as circumstances demand. It should be given in moderate quantities every two hours. Kumiss may be used to vary the diet, and buttermilk, if the child will take it, forms an agreeable change. Liquid predigested beef preparations may also be used. Chicken or veal broth from which the fat has been removed may likewise be given.

Rare or raw meat is usually well borne. It should be scraped fine and given immediately after preparing it. If desired, it may be rolled into small balls. Of this, two or three tablespoonfuls are an average daily allowance. Beef is to be preferred, but mutton may be permitted. Dish gravy from which the fat has been skimmed may be given, and may be served in a green glass if the color of the fluid excites disgust.

After a week or two, if improvement has begun, a malted food may be added to the milk. Eskay's Food is of particular value in these intestinal cases, and is occasionally well borne when even peptonized milk is not. The food should be given at regular-timed intervals; and if one meal is not well borne, nothing should be given until the next regular feeding-time. Absolutely no food should be given between meals. Water may be allowed as desired, but should be given between meals, so as not to interfere with digestion. Four meals a day, or even but three, should be all that is permitted.

As improvement sets in the diet-list may be extended to include junket and simple dishes prepared with milk or eggs or both together. Then a little zwieback, toast, or thin crackers may be allowed. Of the meats, chicken, beef, and mutton are the most preferable. The white meat of boiled or roast fish may be allowed, without any rich sauces, however, and oysters may be given in season. The dietary must not be increased too rapidly, and it is well to allow a month to go by before making any decided changes.

Cereals may be added in the form of a little very thoroughly cooked rice or barley in the broth. Later, green vegetables, of which the best are spinach, cauliflower tops, asparagus-tips, or thoroughly stewed celery, may be given.

If improvement goes on, well-cooked cereals, such as rice and grits, may be given at breakfast. They should be thoroughly cooked and strained if necessary. Oatmeal should not be given until the digestion has become normal. Well-cooked macaroni makes a pleasant change, and fresh-fruit juices may be given, preferably an hour before meals. Of the latter, orange-juice is best, but in season the juice of fully ripened peaches or grapes, without skins or seeds, may be given.

As improvement progresses, cream and butter may be added. A

very small portion of well-baked, mealy potato may be given, with the addition of cream. Potatoes should never be given early in the treatment, and, when this food is added the effect should carefully be watched.

The dieting must be continued for a year or more, and for several years later the diet must be carefully supervised. This must be insisted upon, and is usually not a difficult matter after improper feeding has brought on a relapse. Although every care should be taken to avoid relapses, when they occur they form the most powerful incentive for vigilance on the part of the nurse or mother.

Directions as to quantities and preparation of food and the hours of feeding should be written out, and a careful record kept of what the child takes, and the quantity, as well as the number and character of the stools. By this plan it is frequently easy to detect idiosyncrasies, and to learn what agrees and what disagrees with the particular patient in charge.

A point of no small importance is the avoidance of starvation. Unless a physician thoroughly understands the feeding of infants he may starve a child and render it weak, anemic, and unable to withstand the effects of the disease. Cases that have been set down as intractable catarrh of the intestine are often merely the results of starvation or due to an unsuitable milk mixture. In such cases, with return to a rational diet recovery promptly follows.

Acute Sugar Poisoning.—In cases in which there is nutritional disturbance sugar may at times cause a symptom-complex, which when recognized should be followed by discontinuing all sugar, and, indeed, all food for a day or two. And when feeding is begun sugar should be withheld. Human milk is the best food in these cases. Albumin milk or buttermilk is the best substitute. There is a history of a loss of weight and diarrhea, with thin, green stools. There is great prostration, with drowsiness and short periods of coma. There is irregular, usually high fever, shallow, irregular respiration, weak irregular pulse, albumin and sugar in the urine. The character of sugar in the urine is that which has been given. Lactose may not be noted if Fehling's test is used as it requires prolonged boiling. The phenyl-hydrazin test is better.

Intolerance to Fat.—This is frequently noted in infants and also in older individuals. In infants it may produce vomiting one or two hours after feeding, or the symptoms may be largely referable to the intestines. In this case there are colic and large white stools, or sometimes thin greenish stools, which are very irritating to the skin. Sooner or later there is a marked disturbance of general health, and the children are usually, though not always, pale and thin. In older children an interesting and often wrongly interpreted symptom complex may be noted when too much fat has been added to the diet. This may be done on the advice of the physician, who orders a thin

child to have an abundance of cream, butter, and oil, with the idea of building it up. Older children showing fat intolerance are generally, though not always, pale, thin, and in general bad health. They are irritable, and often have marked circles under the eyes, and the breath has a very foul odor. Often this symptom is the one for which relief is sought. In other children there may be marked gastric and intestinal disturbance, and attacks of colicky diarrhea. Excessive quantities of fat may be found in the stools. Another interesting class of cases are those in which there is recurrent vomiting due to excessive fat. The diagnosis can usually be made by a careful study of the diet and stools, and confirmed by the effect of treatment, which consists in cutting down the amount of fat in the diet. As in older individuals, there is a lack of absorption of fats when there is icterus.

Constipation.—Chronic constipation is the cause of more worry and distress than almost any other condition. In order to relieve it, the diet must be regulated carefully and correct habits be formed. The formation of correct habits is of as much importance as the diet in the prevention and correction of this condition. Infants as young as three months of age may be taught to have a stool regularly by placing them upon a small chamber at a stated hour. In older children a fixed time should be set for the daily visit to the closet. The best time for this is just after a meal, preferably breakfast, as at this time there is a wave of peristalsis of which advantage may be taken.

Constipation is quite common in breast-fed infants, and is usually due to the child's getting a minimum amount of food or a milk that is low in fat and generally high in protein. The quality of the mother's milk should be improved if possible, following the directions previously laid down. Between the nursings the infant should be given water. If this is not sufficient and the mother's milk is found deficient in fat, 1 or 2 teaspoonfuls of cream may be added to each nursing, or cod-liver or olive oil may be given in half to teaspoonful doses. An efficient change in the diet consists in giving 1 or 2 teaspoonfuls of thoroughly cooked oatmeal. This should be of about the consistence of cream, well sweetened with sugar, and strained if necessary. This may be given once, twice, or oftener a day, as the case requires, and is best given with a nursing. Orange-juice well sweetened may be prescribed in doses of a teaspoonful to a tablespoonful, given an hour or so before a nursing. Stewed prune-juice may be used in the same manner, and in season any fruit-juice from perfectly fresh ripe fruit may be utilized. Bottled or fresh grape juice is often of marked benefit. The very acid fruits should not be allowed. A teaspoonful of a malted food prepared with barley may be given, and small amounts of the thick sweet malt extracts may be used with advantage. Dextrimaltose, with or without the addition of potassium bicarbonate or Mellen's Food, may be used as the form of carbohydrate most likely to relieve constipation, but where the baby

is on maltose preparations a change to cane-sugar may give good results. Care should be taken not to disturb the infant's digestion by the too frequent use of any of the articles just mentioned, or by the use of too large quantities; only one article should be tried at a time. If these means fail, drugs or suppositories must temporarily be resorted to. It should be borne in mind that the constant use of drugs may defeat any efforts along dietetic lines.

In bottle-fed babies, if the milk is modified properly, constipation will usually be overcome. If relief is not obtained by this means, measures similar to those directed for breast-fed babies must be taken. A small quantity of barley- or oatmeal-water may be mixed with the milk or a malted food added to it. One-half to one teaspoonful of gelatin added to the day's feeding is of value.

The use of fresh green and other vegetables boiled and mashed or passed through a sieve will be found useful. (See Vegetable Purees in Infant Feeding). Graham or oatmeal crackers moistened with milk are useful and judiciously chosen foods rich in cellulose, such as cauliflower, mashed potato, boiled mashed strained turnips, and particularly oatmeal, will be found useful. Care should be taken not to upset the digestion by giving too much or starting too abruptly.

In older children, fed according to the rules already laid down, constipation is not so frequent, but when the diet is neglected and the child allowed to do as it pleases, it is a very common complaint. A glass of water, either hot or cold, should be given an hour before breakfast. Cream, as well as water, should be added to the milk. Barley- or oatmeal-water may at times be added to the milk with benefit. Meat broths are laxative in their effects when added to this diet. Under eighteen months fruit-juices, or after that time perfectly ripe sound fruit, especially when taken an hour before a meal, is very serviceable. Figs and prunes stewed together are helpful, as are oatmeal and bread made from unbolted flour.

The type of constipation should be ascertained and the child managed accordingly. In a general way the foods which are most useful are those with laxative properties or which furnish bulk. The child should drink plenty of water. Fresh fruits and stewed fruits should be given once or, better, twice a day. Green vegetables which leave a residue are desirable; all sorts of green vegetables may be given. Among those most useful are cabbage, cauliflower, Brussel sprouts, tomatoes, boiled onions, lettuce, endives, sorrel, chicory, water-cress, asparagus, salsify, turnips, rhubarb, carrots, green and dried peas, lima beans, string beans, navy red or black beans, and lentils, either as vegetable or purées. Of the bread-stuffs, whole wheat bread, bran, bran bread or biscuits, laxative bread, gingerbread, rye bread and oatmeal, and graham crackers are best. Of the cereals, oatmeal and cornmeal mush. Of the sweets, honey and syrups in moderation. The following is a suggestion as to a diet list:

Glass of water upon awakening.

7.30 to 8 A. M.—Cornmeal, oatmeal, wheatena, hominy, rice (all cooked four hours the day before in water) served with butter or milk and a little sugar. Bacon, soft boiled, scrambled, or poached egg, minced chicken. Drink of milk. Bread-stuffs.

9 A. M.—Juice of 2 oranges or 6 ounces of prune juice.

12 Noon—Steak, chop, roast beef, poultry, or baked or boiled halibut or codfish. Baked or mashed potato occasionally. Usually two of the following vegetables: spinach, asparagus, peas, string beans, squash, white turnip, stewed carrots, stewed celery, stewed onions, mashed cauliflower.
Desserts: stewed or baked apples, stewed prunes, rice, bread, or tapioca pudding. Gelatin pudding. Bread-stuffs. No milk at this meal.

Rest one and a half hours after this meal.

4 P. M.—Apple, pear, or grapes.

6 P. M.—Farina or Cream of Wheat (cooked two hours in water) or one of the above cereals served in the same way. Custard, cornstarch, junket. Drink of milk. Bread-stuffs. Occasionally 4 ounces of water and 1 teaspoonful of Phillip's cocoa or 5 teaspoonfuls of malted milk to 8 ounces of water.
Bread-stuffs: Wheatsworth Biscuit, whole wheat bread, bran bread, laxative bread.

The recipe for laxative bread will be found in the section on Recipes.

Yeast and mixtures of agar and petroleum oils are often used in chronic constipation.

In much older children the management is similar to that recommended for adults.

Inanition.—Inanition is a term loosely applied to various conditions; it should, however, be restricted to those cases of acute starvation coming on in very early life. It is characterized by a loss of weight, and usually by fever as well, and the condition is not infrequently mistaken for some other disease. It follows abstinence from food, such as occurs in those cases where infants are abandoned on door-steps, or are grossly neglected and starved. Other causes are nursing at a dry or nearly dry breast, in which case the child seizes the nipple eagerly and after several vigorous attempts at sucking drops the nipple, cries, and seems to be uncomfortable. Gross errors in feeding, as where a child is given a food absolutely unsuited to its needs, may also bring about this condition. It may occur in infants with enfeebled digestion—either those congenitally debilitated or those rendered so by disease. Sudden changes in food may also occasionally cause it.

In the management of these cases, which is apt to be difficult, the same general routine should be followed as is suggested for marantic babies. If possible, a wet-nurse should be secured. Holt advises that the breast-milk be diluted with an equal volume of water or of lime-water. He also suggests that if there is diarrhea, the milk be pumped from the breasts and the cream removed. The proportion of fat may gradually be increased. When a wet-nurse can not be secured, the child should first be given very dilute mixtures, or a milk so modified as to be indicated for a child much younger than the one in hand. These milk mixtures should be partially or completely peptonized.

The authors have used weak milk mixtures to which Peptogenic Milk Powder has been added, with benefit. These may be given by means of a bottle, or if the child will not suck, by means of a medicine-dropper or spoon, or by gavage if necessary. In all cases in which a child refuses to take food a stomach-tube should be passed in order to ascertain if the esophagus is patent or not, and the fauces should also be examined carefully both by sight and by touch.

If the peptonized milk is not well borne, milk curdled with essence of pepsin or rennet, and then churned or whipped until the curd is finely divided, may be used. Goat's milk may be used or the directions for feeding premature infants followed. In bad cases human milk often offers the only hope. Water, if needed, may be given by subcutaneous injection or by the rectum, a normal salt solution being best for this purpose.

Children very small at birth are best treated in the same manner as premature babies. Inanition in older infants may often be combated by allowing food that would not be permitted under ordinary conditions. Solid food suited for a child twice the age of the one under treatment sometimes succeeds when everything else has failed.

Marasmus.—Marasmus, known also under the names of "wasting disease of children," athrepsia, and simple atrophy, is best described as a condition of pernicious atrophy. The term inanition should be used only for those cases of acute starvation, with their characteristic symptoms and causes, occurring in infants.

Atrophy in infants may be divided into two classes: The primary cases, where the cause is unknown, and the secondary cases, or those that follow definite pathologic conditions. The dividing-line can not at present definitely be drawn. All cases occurring in the course of the easily recognized diseases may at once be placed in the group of secondary cases—those following tuberculosis, for example. Most cases seen clinically occur in infants who have not had proper food and care.

If care is taken to exclude tuberculosis as well as other diseases, the diagnosis of the condition presents no especial difficulties.

In some instances the cause of the disease can not be made out, whereas in other instances it is traceable to improper feeding, lack of care, insufficient exercise, and, most important, lack of fresh air and sunshine.

When cases are seen reasonably early and if the causes can be recognized and remedied, the outlook is good. In private practice cases among the well-to-do usually do well. If seen late, the prognosis is nearly hopeless, and in asylums and infant homes the outlook is most gloomy.

The treatment of these cases is essentially dietary and hygienic, and either measure alone must fail. The child must be kept warm, and in a well-aired room; if possible, it should be given sun-baths

and be taken into the fresh air. In proper seasons of the year it should be out-of-doors most of the time, preferably in the country. The child's body should be massaged gently once or twice daily, using gentle friction and a lubricant such as cocoa-butter or cocoanut oil. The rubbing movements should always be directed toward the heart, so as to facilitate circulation. The child should be carried about and coddled as much as possible, for many of these infants are starving for want of a mother's love as much as for want of food. The child should be fed while lying on the nurse's lap or arm, and not as it lies in the crib. This last is, of course, impracticable in many infant homes and hospitals. In severe cases fluid should be administered following the suggestion made under the head of Acidosis. Fluid should be given in larger quantities than for normal infants, slightly over 3 ounces per pound. What is not taken with the food may be given between the feedings. Sometimes where difficulty is experienced in administering it saccharin may be added to sweeten it. The best food and in many cases the only one which will give success is human milk. This should be given in quantities sufficient to cover the caloric needs, which are from one-half more to double those of normal infants. It is a good plan to give the food every two hours, but there are, of course, some exceptions to this. In severe cases smaller quantities must be used at first, 35 calories per pound (1¾ ounces of milk), and this amount should gradually be increased until 50 calories (2½ ounces of milk) per pound is given. Up to this point the increase should be gradual but steady. Just how fast the milk can be increased is a matter of the individual baby. No attention need be paid to the character of the infant's stools except to see that they are moved daily, as the main thing is to get the child's caloric needs covered as soon as possible. After this point is reached the milk should be increased until the child starts to gain. No increase in weight need be expected early.

The next best method of feeding is part human milk and part substitute, or if no human milk can be obtained, artificial feeding must be used. We have found soy bean and barley gruel and condensed milk the most satisfactory substitute in these cases. Start with a weak gruel, 1 level tablespoonful of each flour to a quart, and a weak sweetened condensed milk mixture, 1 to 16, and increase to 2 level tablespoons of each flour to a quart, and the condensed milk 1 to 8. (See Soy Flour.) Next to this, milk treated with Fairchilds' peptogenic milk powder, or milk curdled with essence of pepsin or rennet and churned or whipped until the curd is finely divided, may be used. Excellent results may be obtained with buttermilk, fat-free lactic acid milk, and later that with the fat left in, and protein milk together with carbohydrate. The caloric value of the food taken must be borne in mind, no matter what food is used. Goats' milk may also be used if available. The same suggestions as to quantity may be

followed as suggested for human milk. Marriott has suggested adding corn syrup, such as that sold under the name of Karo or some similar commercial glucose. These are mixtures of dextrim, maltose, and glucose; 3 per cent. may be added to lactic acid milk, and gradually increased to 8 or even 10 per cent. if the infant will tolerate it. The increase may be made steadily but gradually, and if any diarrhea is started up, the amount may be reduced. Care should be taken not to starve the child on account of abnormal stools. The syrup is best diluted before adding to the milk. Marriott uses 45 volumes of syrup and 55 of water, which gives approximately 50 per cent. carbohydrate; 100 c.c. of this contains about 50 gm. carbohydrates. We always give orange juice or some substitute as soon as it can be borne without causing vomiting, and add phosphorized cod-liver oil a little later if it is tolerated.

In very severe cases intravenous injections of glucose may be used. The size of the injection must not exceed one-fiftieth of the child's weight.

Nursing Homes for Marasmus Cases.—If homes could be established for the nursing and care of marantic babies, the infant mortality from this disease would be greatly diminished. This nursing-home plan has been carried into effect in some of the cities of Germany. In these institutions women who have recently been delivered are cared for on condition that they nourish one or more infants. The quantity of milk secreted by these women under the constant stimulation of several sucking children is remarkable.

It must be remembered that a large percentage of the cases of marasmus occur in children who have been abandoned by their mothers at birth. If a child is nursed at the breast for two or four weeks, it is more likely to improve and live than if it is taken from the breast immediately and given uncertain milk mixtures.

Malnutrition.—Malnutrition is a term applied to cases of defective nutrition that run a more chronic course than those suffering from inanition or marasmus. It occurs in infants and in older children. In the former the management is similar to that of marasmus; in the latter, the same general rules apply. The life of the child must, so far as possible, be carefully regulated, and an abundance of fresh air and sunshine, together with appropriate exercises and intervals of undisturbed rest, enjoined. The diet is, however, the most important element in the treatment. The food should be plain and wholesome, carefully prepared, and given at regular but not too frequent intervals. In some cases it may be found advisable to give smaller meals at shorter intervals. The food should be such as is recommended for normal children; a list of these articles is given elsewhere, where the details of the feeding will also be found.

Feeding after Intubation.—Usually this is accomplished with but little or no difficulty, but in some instances swallowing may at first

be difficult, and in these cases semi-solids, such as junket, soft-boiled eggs or a very light omelet, wine-jelly, or milk-toast, may be substituted for the liquid. If the semisolids fail, it has been suggested that the child be placed with its head lower than its body, and that nourishment be given while in this position. As soon as the child learns to swallow with the tube in place the usual light diet may be given.

Enuresis.—Besides the training and the medicinal treatment, a plain, nutritious diet is of great service in these cases. In the majority of cases of nocturnal enuresis, on questioning it will be found that the children have been getting large quantities of coffee or tea, or that large amounts of water have been taken during the evening, or that the bladder has not been emptied before going to bed. In these cases the treatment is obvious, and consists in excluding coffee, tea, and stimulating foods (spices and the like), and in limiting the amount of fluid taken after four in the afternoon. Much can be done by proper training. When dependent upon other causes, the treatment must be directed toward these conditions.

Rachitis or Rickets.—Rickets is a disease of nutrition, but one that is not well understood. Most of the cases occur in the temperate zone, and southern races transported north seem especially predisposed to it. It is very common among the negroes of Baltimore. The authors have found that nearly 100 per cent. of the infants in asylums for colored children were affected with rickets, whereas in similar institutions for white children in the same city the disease was rare. Italians living in America seem predisposed to it, and children with bad hygienic surroundings are more apt to be affected than those reared amid better conditions. It is a disease of the city. The majority of the cases occur between six months and two years of age; it is not often seen in breast-fed children unless lactation has been continued for too long a period. Holt states that among the Italians in New York City it is not uncommon to find it in children who are breast fed.

This is a disease intimately connected with nutrition, but there are other factors as well. Dick, to whose monograph the reader is referred for a full study of the occurrence of the disease, states that large groups of people living in Western Ireland live on a diet which is thought to cause rickets, yet they do not develop it. He thinks light and fresh air important determining factors, as, indeed, they are, and that rickets will not develop, no matter what the diet, as long as the child is in the light and air. In rickets the tissues and blood are deficient in calcium. Howland and Kramer found that the blood-serum of the normal child contains 9 to 11 milligrams of calcium per 100 c.c., the phosphate averages 4 to 6 milligrams per 100 c.c. In rickets the calcium may be approximately normal and the

phosphate reduced as low as 1 milligram per 100 c.c., or the phosphate may be approximately normal and the calcium reduced, and if it falls below 5 milligrams per 100 c.c. there is a complicating tetany. It is assumed that children with rickets and a low calcium have latent tetany even if it is not manifest. The lesion in rickets seems not to be due so much to the deficiency as to the ratio of the two elements to each other.

It has been taught by some that rickets is due to a diet deficient in vitamin A, but it has been shown that if the required elements are present in the proper ration rickets will not develop even though the diet is deficient in vitamin A, but there is a lack of strength and osteoporosis.

A lack of the calcium-depositing vitamin (see same) apparently causes rickets, at least under certain conditions. This vitamin is found in large quantities in cod-liver oil, and in smaller amounts in butter and possibly other animal fats. Rickets may be prevented or cured by administering cod-liver oil even if the diet is deficient. The cure is greatly facilitated by a proper diet and also by sunlight or light from a mercury vapor light. In experimental animals starvation lessens the rachitic process possibly by drawing the phosphates from the tissues into the blood.

Rickets then occurs in children who have a lack of fresh air, sunlight, and are fed on foods low in fat, often also low in protein and too high in carbohydrates. To prevent the disease the child should be fed on a normal diet as outlined under Infant Feeding.

To cure the disease the best food is good human milk; in a lack of that, cow's milk or goat's milk modified to suit the individual infant should be given; in addition, egg yolk, butter fat, as in cream or butter, for older children if well borne. Bacon drippings or crisp bacon may be used if tolerated. Green vegetables in soups or purées should be added as soon as possible, and some form of fresh fruit juice and purées of the legumes and soy flour are also useful. Scraped meat may be given. At first the carbohydrate food should be withdrawn, but as soon as the child is better small amounts may be added. Oatmeal is perhaps one of the best.

A child returned to a normal diet will be cured rapidly if the disease is not too far advanced by the administration of cod-liver oil. We usually use an oil to which 1/25 grain of phosphorus has been added to each ounce, as suggested by Kassowitz years ago, but the plain oil or an emulsion may be used in place of this. Cod-liver oil is practically a specific. In addition, sunlight, not through glass, or the light from mercury vapor lights should be used and plenty of fresh air and proper care.

Any child sweating, especially about the head, showing tenderness in handling and restlessness, especially at night, should be carefully

examined for evidences of rickets, placed on a proper diet, and given cod-liver oil.

In children fed artificially by improper methods rickets is apt to develop. A food low in fats is especially liable to produce the disease, particularly if, at the same time, the proteins are also deficient. In such a diet there is almost certain to be either an excess of the carbohydrates or of some substance unsuited to the child's digestion. Among foods that cause rickets may be mentioned some of the proprietary foods and condensed milk.

The lime salts are, under certain conditions, apparently absorbed with difficulty, and this would seem to be the case when the food is deficient in fat. Hence if the child's diet lacks fat or if the lime salts are deficient, the bones will be improperly nourished.

Diet.—The feeding in rickets is very simple, and when it is possible to combine with it outdoor life and proper care and nursing, is very efficient. If the child must be fed artificially, and if it exhibits symptoms that are suggestive, such as sweating, tenderness, or restlessness at night, it should be given cream or cod-liver oil in addition to the proper diet. In this way the disease may be prevented. When the disease has developed, the child should be placed on a diet suitable to its age, as suggested in the section on the Feeding of Infants; the food should consist in fresh milk, eggs, meat, vegetables, and fruit. The basis of the diet should be milk, which should contain 4 per cent. of fat if the child can digest that amount and is old enough to receive it. Fat in some form must be supplied, and where cream is not well borne, other forms may be tried or they may be given in combination. Of these, cod-liver oil is one of the most valuable, and may be given plain, in teaspoonful doses or less, so as not to disturb the digestion. If the plain oil is not well borne, it may be given in the form of an emulsion or with malt preparations. Fat bacon browned to a crisp by dropping small pieces in boiling grease may be tried, and will often agree where other fats do not. Bacon fat dropped on zwieback is very useful. Butter may be used, but in large amounts this may not be so well borne as the other forms. Care should be taken that too much be not given and the child's digestion disturbed by excess of fat.

Very young infants with rickets do best on human milk and it should be secured if possible. This may be supplemented with cows' milk if necessary. Vegetable purées, as described elsewhere in this volume, should be given as well and scraped meats, and fresh or stewed fruit juice added to the diet. The carbohydrates should be limited, but not excluded from the dietary. Soy flour added to the milk, as a gruel or added to soups or cereals supplies additional fat and protein in a form readily utilized.

Spasmophilia.—These infants show an increased irritability of the

nervous system. Latent spasmophilia may be detected by reactions to the galvanic current, by Chvostek's sign, etc. Advanced cases show characteristic tetany, others general convulsions, laryngospasm, and the like. It is seen in rickets, where certain salts are deficient, and may be caused by too much sodium bicarbonate and in other ways. The present theory is that it is intimately connected with the calcium and phosphorus metabolism. Howland and his associates found in rickets alone a deficiency of phosphorus in the blood, with the calcium nearly normal; where tetany was present there was low calcium and nearly normal phosphorus.

Children fed on human milk rarely have spasmophilia, and those in whom it is latent or suspected should be fed on this if possible. It is seen in children fed on cow's milk, so that it is well to reduce the cow's milk and feed part of the milk as protein or calcium caseinate milk. Vegetables and cereals should be added early, and fruit juice begun after the first ten days or two weeks of life. Potassium and sodium salts should not be given to these infants, but they should be given phosphorized cod-liver oil, and either calcium chlorid or calcium lactate. The latter two in doses of from 7 to 15 grains in solution and added to the food. These usually afford prompt relief, and the condition may generally be prevented by proper diet and phosphorized cod-liver oil. Fresh air and sunlight (not through glass) are imperative.

Celiac Disease.—Since Samuel Gee described this in 1888, in the Reports of St. Bartholomew's Hospital, and Cheadle wrote on Acholia, and Herter on Intestinal Infantilism, there have been a large number of somewhat conflicting articles. From the standpoint of diet it is not so important to know the etiology (and who does?) as the clinical facts. There are a group of cases characterized by lack of growth, enlarged abdomen, poor appetite, and at times irregular fever, in which the digestive powers are below normal. This lack of digestion has been attributed to intestine, to pancreas, and to liver. The important fact is that there is fat indigestion and fermentation, and in some cases very marked starch indigestion. The stools in the typical cases are very large, unformed, pale, very offensive, and usually, though not always, frequent. Sometimes there is no diarrhea and the stools form, but contain undigested fat. The character of stool is somewhat dependent on the character of fat present. If neutral fat is in excess the stools are oily and the oil droplets are separate; if fatty acids, the stools are greasy and homogeneous, both of these pale and offensive. If soaps are in excess the stools are colored, homogeneous, and not so offensive.

The diet is of primary importance, but only study of the individual needs brings good results. The child should be placed on a diet free from fats and carbohydrates until fermentation has ceased. Then

very gradual increases can be made, but if symptoms recur the treatment should be begun at the beginning.

Protein milk or one of the similar preparations should be used at the beginning, together with curd and gelatin jellies, all of which may be given freely. Soy flour cooked like a cereal and flavored with tomato juice is also well borne, as is orange juice. A dram of cod-liver oil a day may be mixed with curd or given plain. As improvement takes place other foods low in carbohydrates and fat may be added.

We have found the following foods useful: Protein milk or similar preparations, skimmed milk, buttermilk, curd, junket made from skimmed milk; gelatin; soy bean flour; lean meats scraped fine; lean boiled fish; white of egg.

As soon as possible add vegetables containing little starch or fat. These should be very finely divided or put through a sieve. Later so much care is not needed. Spinach, lettuce, cauliflower, green peas, string beans, salsify, vegetable marrow, asparagus, tomatoes, celery.

Orange juice, grape-fruit juice, and lemon juice are usually well tolerated early, and stewed apples and peas, rhubarb, and peaches may also be well borne. Small quantities should be tried first so as not to cause too great an upset. Banana flour and bananas whipped as smooth as mayonnaise dressing are often useful.

Sugars are well borne by some; dextrimaltose and corn syrup (Karo) are less liable to ferment, and the sugars in fruits, as mentioned above, and as grape juice or honey, may be tried. Cane-sugar should be tried out cautiously.

After fermentation has disappeared starches may be added cautiously in vegetables containing small amounts of carbohydrates. (Lists will be found under Diabetes and elsewhere in this volume.) Starchy foods may have to be withheld for long periods. Fats are added very gradually and in small quantities, but there are some cases in which they may be given comparatively early, as crisp bacon and whole milk, butter, yolk of egg, and the like.

Care should be taken to supply sufficient vitamins in all cases, and *early*. This may be done by adding 20 drops of cod-liver oil three times a day to the diet, the juice of tomatoes, orange juice and spinach, or lettuce.

In some cases starchy foods to which takadiastase has been added before giving may be useful. Bile salts and pancreas extracts have their advocates. (See also Fat-free Diet and Diet in Diseases of the Pancreas.)

Brown, Courtney, and MacLachlan (British Journal of Diseases of Children, 19, 113, 1922) give the following lists as suggestions as to the arrangement of the diet:

Diet for Mild Type

Breakfast:

Rice, oatmeal, farina, cream of wheat, cornmeal, hominy (all cooked four hours), 1 to 3 rounded tablespoons.

1 to 3 pieces of lean bacon or 1 to 3 tablespoons of beef, chop, or chicken.

1 to 2 pieces of zwieback (unsweetened).

6 to 8 ounces of 2 per cent. lactic acid milk or plain boiled 2 per cent. skimmed milk.

Dinner:

1 to 4 rounded tablespoons of scraped steak, chop, or chicken, soft-boiled, poached, or scrambled egg.

1 to 2 tablespoons of peas, spinach, lima beans, lentils, carrots (all put through a sieve).

Custard, cornstarch, or junket, occasionally (if constipated and it is tolerated) 1 to 2 tablespoons of apple sauce or pulp of prunes.

1 to 2 pieces of zwieback (unsweetened).

Tea:

Same as breakfast; in addition add custard, cornstarch, or junket if hungry.

Diet for Moderately Severe Type

Breakfast:

Rice, oatmeal, farina, or cream of wheat (cooked four hours), 1 to 3 rounded teaspoons.

3 pieces of lean bacon or 1 to 3 tablespoons of beef, chop, or chicken.

1 zwieback (unsweetened).

6 to 8 ounces of protein milk or 2 per cent. lactic acid milk.

Dinner:

1 to 4 rounded tablespoons of scraped steak, chop, or chicken, occasionally a soft-boiled egg.

2 cups of junket with the whey removed, or

1 cup of custard or cornstarch.

1 zwieback (unsweetened).

6 ounces of protein milk or 2 per cent. lactic acid milk.

Tea:

Same as breakfast, without the meat; occasionally cream cheese or plain gelatin pudding.

N. B.—Many patients are allowed as much junket curds as they will take.

Diet for Severe Type

Diet A:

Protein milk 8 to 10 ounces every four hours for five feedings. This initial or corrective diet may last for weeks, depending upon the rapidity with which all signs of carbohydrate indigestion disappear.

Diet B:

6 A. M.—8 ounces protein milk.

10 A. M.—1 to 3 rounded tablespoons of curds, 8 to 10 ounces protein milk.

2 P. M.—Same as 10 A. M.

6 P. M.—Same as 10 A. M.

10 P. M.—6 to 8 ounces protein milk.

The duration of this diet may be from ten days to several weeks, depending on the tolerance of the child. Patients not only make a pronounced qualitative gain, but actually increase in weight a very appreciable amount in spite of the low carbohydrate content.

Diet C:

6 A. M.—8 ounces protein milk.

10 A. M.—1 to 4 rounded tablespoons of curds, 8 to 10 ounces protein milk.

2 P. M.—1 increasing to 4 rounded tablespoons scraped steak or chicken, 1 to 4 tablespoons curds.

6 P. M.—Same as 10 A. M.

10 P. M.—6 to 8 ounces protein milk.

DIET D:

Breakfast:

4 to 5 tablespoons bacon or chicken.
3 to 4 tablespoons curds, 8 to 10 ounces protein milk.

Dinner:

4 to 5 tablespoons chicken, chop or beef, 4 tablespoons curds.
1 to 4 tablespoons cream cheese or 1 ounce gelatin.
8 to 10 ounces protein milk.

Tea:

4 tablespoons chicken, 4 tablespoons curds.
10 ounces protein milk.

The above-mentioned diets are referred to in the text as high protein. To Diet D carbohydrates are gradually added in the following order, replacing one or more of the protein foods: Rice, 1 tablespoon, increasing to 3 tablespoons; farina or cream of wheat; peas; spinach, carrots; ½ increasing to 1 zwieback.

DIET FOR SPECIAL CONDITIONS

DIET FOR THE AGED

When a man has passed his fiftieth year his diet should be guarded. Dietary indiscretions or a too plentiful diet will result either in the putting on of flesh and the consequent discomforts of obesity or in the development of gout or allied affections. In considering the diet of the aged the old dictum that a man is as old as his arteries applies. *Age can not always be counted by years.* In the aged there is a lessening of all physical activities. The old man takes less exercise, has diminished powers of digestion, and is less able to absorb the nutriment he has digested. His circulation is poor and his bowels are constipated. Degenerative processes have taken place in his organs, and he is more apt to feel the effects of indiscretions in diet. For these reasons the diet should be lighter than in younger years, and the amount of food eaten should vary with the needs of the individual. The food should be of an easily digestible variety; it should be given in smaller quantities at a time, and the intervals between meals should be shortened. If there is a tendency to obesity, food that is apt to be converted into fat should be given in diminished amounts. The proteins should be somewhat lessened from time to time. The practice of eating heavy suppers late at night and of eating between meals should be discontinued. The person should learn what particular articles of food disagree with him, and refrain from eating foods that tend to cause flatulence. Yeo suggests that in the case of cooked fruits a small quantity (about a teaspoonful to the pound of fruit) of sodium bicarbonate be stewed with them, to correct the acidity that causes flatulence.

In the aged food bears a close relation to sleep. A cup of hot milk, hot toddy, or some hot liquid food taken at bed-time will often overcome troublesome sleeplessness. A few sips of milk or a mild stimulant taken during the early morning hours, when the aged are apt to awaken, will frequently insure sleep again.

Another point of interest is the question of mastication, as in the aged the teeth are liable either to be lost entirely or to be unfitted for chewing. The rather general use of false teeth has largely remedied this, but it may be necessary to point out that farinaceous foods, which slip easily and quickly into the stomach, must either be avoided or chewed thoroughly, so as to prevent indigestion and flatulence. When the teeth are lost, or are defective, the food should be soft in character. Meats should be minced or cut in very small pieces, or served in soft stews, and hard crusts and the like softened

by soaking in milk, tea, or coffee. Chewing should be insisted on to insalivate the starchy foods.

The digestive abilities of aged people vary greatly, some taking but little food and experiencing difficulty even then, while others eat a great deal more and seem to enjoy it more than they did in their younger years. This latter class sometimes pave the way for various difficulties later by their inordinate eating. When they have high arterial tension, complain of giddiness, flushing after meals, and sometimes of nosebleed, it is well to limit the amount of food taken; the same is true where there is a tendency to obesity, and old, obese persons with chronic bronchitis are frequently benefitted by a carefully adjusted diet.

All complicated dishes are best avoided, as well as those which are highly seasoned or strongly flavored. All foods which are liable to cause digestive disturbance or toxemia should be let alone, as many an old person is carried off by ptomaine poisoning caused by some gamey food, which one with a vigorous digestion might have eaten with impunity. Stale canned foods should not be taken at all, and articles of diet which the individual knows from experience will cause trouble should be avoided. As people grow older it is a general rule that they crave sweets less, and that sugars are less easily digested and are more liable to cause indigestion and flatulence. Whenever colic is complained of, the sweets should be cut down in quantity or avoided altogether, and if this does not remedy it, the cause should be sought either in farinaceous foods or vegetables of the cabbage family, or the legumes.

Foods Suitable for the Aged.—Milk may be taken in all forms when easily digested, and when it is not well borne the addition of warm Vichy or warm water will often prove helpful, or the milk may be diluted with cereal gruels, or have sodium citrate (one grain to the ounce) added to it. Beef-tea is often useful and beef juices may also be used if desired. Eggs, lightly cooked or beaten up with milk, are very useful, as are nutritious soups, such as chicken or fish purées, mutton, beef, or chicken broth. Young and tender chicken, game and other tender meats, and good quality potted chicken or other potted meats may be taken, and sweetbreads are easily digested if fresh and properly prepared, but may be contraindicated on account of the purin nitrogen contained. White fish, such as sole, whiting, smelts, and the like, are all suitable, and are best when boiled. Crisp grilled bacon is relished by many.

The following foods are all suitable: Bread-and-milk made with the crumbs of stale bread and without lumps. Porridge and oatmeal gruel. Puddings of ground rice, tapioca, arrow-root, sago, macaroni, with milk or eggs, and flavored with spices or served with fruit-juice or jelly; bread and butter, the bread to be at least a day old; rusk, to be soaked in tea or milk and water. Prepared foods, con-

sisting of predigested starches; at this age the digestive ferments are provided scantily by the digestive organs, and soluble carbohydrates are valuable for maintaining the body-heat. All farinaceous foods should be subjected to a high temperature for some time during the cooking process, so as to render the starch-granules more digestible.

Vegetable purées of all kinds may be taken in moderation—*e. g.*, potatoes, carrots, spinach, and other succulent vegetables. Potatoes and fresh vegetables are a necessity; if omitted, a scorbutic state may be engendered. Stewed celery and stewed Spanish or Portugal onions lend variety to the diet. Stewed or baked fruits, fruit-jellies, and the pulp of perfectly ripe raw fruits in small quantity may be taken.

Dr. George S. Keith, in his Fads of an Old Physician, gives the following account of his diet in his old age:

"For breakfast I have a large cup of tea, with milk or cream; brown bread from two to three ounces; and usually one and a half ounces of fish, or half that quantity, and that very rarely, of bacon. Sometimes for a few days I take a cup of coffee with half milk, but no fish or bacon. Lunch is a cup of cocoa or chocolate, if the weather be cold; if it is warm, a small tumbler of milk, about six ounces, with the same quantity of bread as at breakfast. At both meals I use butter, not a quarter of an ounce, and quite as much jelly or marmalade. This is my usual lunch, but occasionally instead of cocoa I have a baked apple, or some prunes with milk, or strawberries with cream so long as I can get them, or very rarely vegetable soup. When I have no milk I take usually a morsel (not half an ounce) of cheese. At 4 P. M., a small cup of tea, and sometimes biscuit or cake. For dinner, at 7, which is my chief meal, I have soup, from peas, lentils, potatoes, celery, carrots, etc., the first two made with no meat stock, and the others with a little from lamb or a bone; or fish soup, the only animal soup I indulge in. Fish, mostly white deep-sea fish direct from Montrose; of this I take no more than three ounces, with a potato and always another vegetable fresh from the garden. If there is no fish, I may take once or twice a week an ounce or two, certainly not more, of lamb, game, rabbit, or tripe; but often I have neither fish nor flesh. The dinner ends with stewed fruit with cream, or pudding, or fruit tart; of these I take a fair helping. During the winter season, instead of fruit or pudding, I often have celery, with cheese, oatcake and butter. On this diet I enjoy the best of health, and for my age (seventy-eight) am up to a fair amount of exercise, walking three to six miles daily in good and sometimes in bad weather, and usually part of this is up a steep road with a rise of 250 feet. The only confession I have to make is that when at home I do not rise till I have had breakfast and read the newspaper. This is a habit I have recommended to many approaching my own age, and those who have tried it admit that they are stronger for the rest of the day. I enjoy breakfast just as much as my other meals, though

I never feel what can be called hunger, and have not done so for many years. I could omit a meal at any time without discomfort. This I have long looked upon as the best proof of perfect digestion. During very warm months I take rather less bread and butter, and I do not try to make this up by taking anything else."

DIET DURING PREGNANCY AND THE PUERPERIUM

Diet during Pregnancy.—Under ordinary circumstances no other diet than that to which the patient is accustomed is advisable. The food should be plentiful and nourishing. All highly seasoned food and indigestible articles are to be avoided, as are all articles which are known to disagree with the patient. When there is a morbid craving for unsuitable things the patient should be carefully guarded against indulging her appetite. Special diets may be ordered for patients with diabetes or heart disease, or where the patient is gouty, over-fat, anemic, or chlorotic. Prochownick [1] has called especial attention to these conditions.

Hofmann states that, during the hunger blockade in Central Europe during the period of the war, undernourished women bore children of normal size, but were unable to nurse them.

The diet of the pregnant woman should be carefully scrutinized to see that it contains sufficient vitamins, particularly vitamin A, and of no less importance that calcium-containing foods are present in sufficient amounts, as otherwise the body of the mother will be robbed of its calcium to supply the needs of the child, as is evidenced by the frequent diseases of teeth and bones during pregnancy.

Diet in Obesity and Pregnancy.—In general, the diet is the same as advised in obesity. This should be combined with exercise, either walking or light gymnastics and massage, which should not, however, be given over the abdomen. The diet should consist of meat, fish, green vegetables, fruit, and a small allowance of carbohydrates. Prochownick allows 4 or 5 ounces (120–150 grams) daily. Fruit is permitted, but should not be eaten in too large quantities nor to relieve thirst. The amount of fluid should be restricted to a pint or a pint and a quarter (500–600 ccm.). Prochownick allows a moderate amount of fat, as cream and butter, but not fat sauces. Soups, sweets, spirits, and preserves are to be avoided. The following is a sample dietary as advised by Prochownick:

7.00 A. M.—Four ounces (125 ccm.) coffee with milk; 1⅓ ounces (40 grams) bread and butter; 1 or 2 eggs; a little fruit, before or after this 40 to 45 minutes walking.

10.00 A. M.—Massage or gymnastics.

10.30 A. M.—Fruit; 1 egg; a very small slice of bread and butter.

Midday.—Roast or boiled meat or fish; vegetables, no beets or peas;

[1] *Therapeutische Monatschrift*, 1901.

salad; cheese; fruit; 4 ounces (125 ccm.) water or wine and water. No afternoon nap.

4.00 P. M.—A small cup of coffee or tea, not over 3 ounces (100 ccm.); a very small slice of bread and butter; an egg, if necessary. Walk for an hour or an hour and a half.

7.30 P. M.—Eggs or cold meat; 4 to 6 ounces (125–200 ccm.) tea or milk; 1 to 2 ounces (40–60 grams) bread; butter; fruit or salad.

Thirst is usually complained of early in the treatment. The diet should be varied to suit the patient, and the routine should be so arranged as not to be disagreeable to the patient. The result of the lowered amount of fluid and carbohydrate, together with the exercise and massage, is to reduce the amount of fat, tone up the system, and to produce a small child, so that labor is made easier. The urine should be examined from time to time and the patient should be weighed.

Prochownick's Diet in Pelvic Contraction.—According to Prochownick, Florschütz, and others, a diet deficient in carbohydrates and fluids will result in a small child without otherwise influencing its development, a view which has been confirmed by Patton in England. The diet is advised in women who have previously borne very large children and in women with contracted pelves. In the latter, Prochownick does not advise the diet when the conjugata vera is below 8 cm., but there are instances where the child was born alive and well with the conjugata vera 7, 5, 7, and even 6.5 cm. By following his plan difficult labor may often be obviated, and even the induction of premature labor unnecessary. The diet may be begun ten or twelve weeks before the birth is expected, and after the first week or two should be rigidly followed. Fraenkel advises beginning four or five months before delivery. The average diet consists of 140 to 160 grams of protein, 80 to 130 grams of fat, and 100 grams of carbohydrates, altogether a value of 1800 to 2000 calories. The fluid should be restricted to about 500 ccm. per day. Prochownick's original diet [1] is as follows:

Breakfast.—One small cup of coffee (3 oz.–100 ccm.); zwieback or bread (1 ounce–25 grams); a little butter.

Dinner.—Any kind of meat, eggs, or fish, with little sauce; green vegetables prepared with fat (as cream); salad; cheese.

Supper.—Same as dinner, with 1 to 1½ ounces (40–50 grams) bread, and as much butter as desired.

Absolutely forbidden.—Water, soups, potatoes, desserts, sugar, and beer.

Drink per day.—Red or moselle wine, 9 to 12 ounces (300–400 ccm.).

All the mothers bore this diet well after getting used to it. Thirst was complained of during the early part of the treatment, and is

[1] *Centralblatt für Gynäkologie,* 1889, 33.

especially noticeable in fat women. Some object to the large quantities of animal food, but this is overcome by the use of green vegetables and salads. All the confinements reported have been easier than on previous occasions, even when the child was large and fat, and all the children were born alive even though the majority of the mothers had had previous miscarriages. The children were lean at birth, with the bones of the head unusually mobile. The children were all apparently mature in every way. In the majority of instances the child gained normally after birth, and the diet apparently had no bad influence on lactation. The urine should be examined regularly and the amount of urea estimated. It has been suggested that such diet would favor eclampsia, but this has not been borne out clinically.

Diet during the Puerperium.—Formerly great restrictions were placed on the diet of a recently delivered woman, thus accounting, in part, for the loss of weight that has been noted. If there is no nausea and the patient desires it, a cup of tea or a glass of warm milk may be given soon after delivery.

The appetite is generally poor for a few days after delivery, but food should be given at regular intervals not too widely separated. The first day water should be given in as large quantities as desired, together with milk and, if accustomed to them, coffee, tea, or cocoa. To this may be added, according to the appetite, boiled or poached eggs with buttered or dry toast. On the second or third days soups, meat broths, beef tea, raw or stewed oysters, sweetbreads, gelatin jellies, custards, junkets, and, if in very good condition and hungry, a small quantity of meat. On the fourth day meats, baked potatoes, rice, cereals, and vegetables may be given. On the fifth day the diet may be that to which the patient is ordinarily accustomed.

DIET IN THE SPECIAL DISEASES OF PREGNANCY

Lowered Urea Output.—During pregnancy the urine should be watched closely, and an examination for albumin be made weekly, especially if there is the slightest reason to suspect kidney disease. If albumin is found or if any untoward symptoms arise, the urea output for twenty-four hours should be estimated. If the quantity excreted is below normal, the patient should be put at once on a milk diet, the milk generally being skimmed (see Milk Cure and Diet in Nephritis). If the patient tires of this, lettuce salad and bread and butter may be allowed in addition, together with zwieback or biscuits (crackers). Very small quantities of herring roe may be given as a relish. An abundance of water, either plain water or what is known as Buffalo Lithia Water, should be drunk. Cream-of-tartar lemonade (one dram to the pint) is also useful as a beverage.

Salivation.—If this occurs, the patient should be put upon a rigorous milk diet.

Gingivitis.—In this condition a generous, well-mixed diet, including fruit and fresh vegetables, is indicated. In addition tonics and astringent mouth-washes, especially those containing the tincture of myrrh, are to be prescribed.

Pernicious Vomiting.—This is often associated with diseased conditions of the kidney. Whatever the cause, the patient should be kept in bed and placed upon a restricted diet, consisting of peptonized milk and similar preparations, given in small quantities at intervals of three or four hours, or even oftener. Rectal feeding may be employed for several days, the patient being given little or nothing by the mouth. High injections of salt solution help to allay thirst and to control the condition itself. When the vomiting has ceased, the return to an ordinary diet should be slowly and carefully made.

Eclampsia.—During the hunger blockade in Central Europe during the war it was noted by Gesner, Warnekros, and others that there was a marked decrease in eclampsia in the cities, while there was little or no decrease in the women dwelling in the country. This has been attributed to the city dwellers having a diet exceedingly low in meat and fats, together with an increase in vegetables, and in most cases this combined with hard physical labor. This furnished a suggestion as to a preventive diet for eclampsia, and it should be borne in mind that the milk diet will do the same thing. In both instances the diets are high in their inorganic salt content. The subject of diet and its relation to eclampsia needs further study.

Aberrant Mental Conditions during Pregnancy.—The patient should be placed in bed, if possible, and excretion promoted by means of baths and the like. An exclusive milk diet (or one that is nearly so) is generally to be preferred.

THE EFFECT OF DIET ON THE DEVELOPMENT AND STRUCTURE OF THE UTERUS

Malcolm Campbell[1] has drawn the following deductions from his experiments on rats: 1. The use of a non-physiological diet—for example, exclusive flesh, rice, or porridge—induces in the great majority of cases a modification in the structure of the uterine mucous membrane. This modification consists in a diminution in the number of large connective-tissue type of cells, which appear to be important constituents in a physiologically active mucosa. 2. The structural change is most profound in animals fed from weaning on an exclusively ox-flesh diet. In such animals the development of the uterus is also most interfered with. 3. The structural change is associated with sterility. Watson has pointed out that a meat diet, if begun at weaning, almost invariably led to sterility, which is probably due to

[1] British Medical Journal, May 25, 1907, p. 1229.

the structural developmental abnormalities in the uterus induced by the abnormal diet. Campbell also calls attention to the fact that the consumption of meat per head in England and Scotland is almost seventeen times as great as it was in 1750. During the same time there has been a marked fall in the birth rate.

The Effect of Diet on Sterility.—Various observers have found that deficient diets used experimentally in rats produce sterility, due not only to the female, as noted above, but to changes in the male. Similar observations on a small scale have been made on human beings, but not in sufficient numbers to permit dogmatic statements at the present time.

SPECIAL METHODS OF FEEDING

RECTAL FEEDING

Nutrient Enemata.—The administration of food by the rectum is a method of feeding of ancient origin. Ætius and others mention it, and writers during the Middle Ages have referred to it, though not in very glowing terms, their imperfect technic probably resulting in practical failure. Voit and Bauer found that a dog's rectum would not absorb egg-albumin and water unless sodium chlorid were mixed with it. This last seems to cause reverse peristalsis, and Grützner has shown that substances introduced with the salt solution may be found in the stomach, a fact that has been confirmed by Swieznski.

Bauer believes that but one-fourth of the nutriment needed by the body can be absorbed by the rectum, and both he and the earlier writers placed the limit of time during which rectal feeding was practicable at from one to two weeks. With careful technique, this period may be extended from four to six weeks, depending on the capacity of the individual for continued absorption, and on the amount of energy stored up in his body at the beginning of the rectal feeding; but von Leube has kept a patient alive for six months, and Riegel for ten months, on exclusively rectal feeding. Some of the more recent writers have insisted strongly on the limits of rectal feeding, which are, perhaps, often misunderstood. As only about one-fourth, and often even less, of the amount of nutriment needed can be absorbed, the method is only useful in protecting the body from excessive loss during periods of partial or complete starvation due to causes enumerated below.

It should be borne in mind that the patient starts on his period of rectal feeding with more strength than he will have later on, and surgeons and others should not attempt to build up a patient by a period of rectal feeding. In some protracted cases the metabolic processes evidently are carried on at a very low rate, and the small amount of nourishment given by the rectum may aid materially in keeping the patient alive, and in other cases it may bridge over a critical period.

In starvation it is thought that the amino-acids in the circulation from tissue destruction may be used to build up other tissues to some extent.

All the various foods may be utilized in rectal feeding, but investigators are not in accord as to the best forms nor as to the amounts absorbed and the subject is still worthy of further study. There are

probably wide individual variations so that many careful abbreviations will have to be made to get at the real facts. If von Leube and Riegel are to be believed as to the length of time patients can be kept alive on milk, yolk of egg and wine mixtures, then the recent investigations may place too low a limit on the capabilities of the bowel to absorb food administered in this way. Reverse peristalsis might explain some of the exceptions.

Edsall places the amount of nutriment that it is possible to absorb by rectal feeding at about one-sixth the requirements of the body. As far as the protein is concerned it is highly probable that some thought to be absorbed as food was destroyed by bacterial action. Studies by Short and Byswater (British Medical Journal 1913, 1, 1361) on the nitrogen output in the urine of patients fed on milk and egg mixtures was about that of fasting individuals, but those fed on amino-acids produced in the laboratory and on milk pancreatized for twenty-four hours showed better results. They suggest that nutrient enemata should consist of aminoids, commercially prepared amino-acids. The aminoids made by the Arlington Chemical Company have a value of 90 calories per ounce. As far as we know no reports have been published on the use of these, but they have been tried without any untoward effects and apparently with decided benefit. The substance requires further investigation. One of the French writers, Berthelot, thought that untoward results were sometimes obtained from certain preparations obtained by complete enzymic hydrolysis of meat which he attributed to the preservatives used. From a sample of aminoids there was a total nitrogen of 11.98 per cent. Amino nitrogen equals 8.90 per cent., or what is a little over 74 per cent. of the total nitrogen in the particular sample. From 30 grams of this there were 3.59 grams nitrogen; 74 per cent. of this would yield 2.6 grams of amino acid nitrogen, which theoretically should be ready for blood absorption. Aminoids may be administered alone or with dilute alcohol solution. It should be remembered that this material, while very promising, is still in the observational stage. Pancreatized milk (twenty-four hours) either plain or to which dextrose and alcohol and salt have been added, may be used and may be alternated with the dextrose alcohol mixture suggested for the drop method. Dextrose seems to be the best carbohydrate for rectal feeding.

There is a great deal of difference of opinion about the absorption of fat. Until it has been definitely disproved that fats cannot be utilized by this method we suggest their use, perhaps best in the form of fresh yolk of egg, one or two of which may be added to the above or to plain twenty-four-hour pancreatized milk. Other animal fats of low melting point, as cod-liver oil very thoroughly emulsified or better, homogenized, might be of service. The use of fats requires further observations. Saponified fats have also been suggested.

As far as we know little has been done in the way of supplying the mineral constituents except as they are present in milk or egg yolk.

Alcohol is apparently well absorbed in 0.5 to 2 per cent. solutions, and is a valuable adjunct to nutritive enemata. It would seem that it increases the absorbability of the other constituents of an enema. Salt may be added with advantage up to 1 per cent. and seems to aid in absorption.

The success of the method depends largely on proper technic. With poor technic the rectum soon becomes irritable, and for this reason rectal feeding should not be intrusted to the nurse or the family, but the physician himself should see that it is properly conducted. In hospitals or in private practice where the nurse has been specially trained general directions may suffice, but in any case explicit written directions are advisable. Once the rectum becomes irritable the process is conducted with difficulty.

Procedure.—The rectum should be cleansed thoroughly by administering a high injection of normal salt solution one hour before the enema is to be given. This cleansing should be practised at least once a day, and if much mucus is present, it may be well to precede each feeding by a cleansing enema. If the rectum is inflamed, a solution of boric acid may be used instead of the salt solution, or if there is much mucus, a solution of sodium bicarbonate may be employed—a teaspoonful of either to the pint of water being sufficient. For the first one or two cleansing enemata the bowel should be flushed by the ordinary method; later a return-flow catheter may be used; with this several quarts of solution may be used; without it ½ to 1 pint will be sufficient in most cases.

The temperature of the cleansing enemata should be between 95° and 99° F.; that of the enemata which are to be retained, between 90° and 95° F. Solutions that are too hot or too cold will promptly be rejected.

The patient should lie on his side, with the hips well elevated. On account of disease this position may be impracticable. A rectal tube or a large catheter should be used. This should not, however, be too large; a tube 1 cm. (about half an inch or less) being the proper size for an adult. For children the tube should be proportionately smaller. It should be lubricated thoroughly, but glycerin should not be used for this purpose.

In introducing the tube, it should be twisted slightly, which lessens the liability of its becoming impacted in the rectal folds. If it is not passed easily, a small quantity of the fluid should be allowed to flow in, which will serve to balloon out the rectum, after which the tube may usually be passed with ease for eight or ten inches or more. The tube should in all cases be introduced as high up as possible, as the enema is thus more likely to be retained and absorbed. Theoretically,

too, it is urged that the blood from the lowest part of the rectum is returned through the vena cava, whereas that from the higher parts returns by way of the portal system and passes directly through the liver. This is of no practical moment here, as sugar solutions absorbed from the rectum, even when introduced into the lower portion, do not cause glycosuria. This is explained by the fact that the lower portion of the rectum has a small capacity and absorbs but little.

The fluid should be allowed to flow in slowly from a funnel or a fountain-syringe. In some instances, where very small injections are being used, a small hard-rubber syringe may be attached to the tube. Care should be taken to avoid injecting air with the fluid. The method of administering nutrient enemata by means of the old-fashioned short hard-rubber nozzle of either a piston or a Davidson syringe can not be too strongly condemned. In the hands of the unskilful it may cause injury to the rectum, and even if used by a trained nurse, only succeeds in placing the fluid in the lower part of the rectum, where it is apt to be expelled.

After the injection the patient should lie as quietly as possible for at least an hour, and be instructed to try to retain the contents of the bowel. A pad of gauze or a towel should be pressed over the anus for twenty minutes or half an hour, and the mind should, if possible, be diverted from the subject. After a few days the bowel often acquires a tolerance for the injections, and they may be retained without difficulty.

If the rectum is irritable and the fluid rejected, it is well to precede the nutrient enema by a small suppository containing opium, or, what is better, a small rectal injection of the tincture of opium may be given. This may be mixed with a little starch water, but the whole should be as small as possible. The opium should not be used unless necessary, and the dose should be just sufficient to quiet the bowel; or the opium may be added directly to the enema.

If there are hemorrhoids, rectal feeding will be greatly interfered with. Before each injection they may be painted with a 2 per cent. cocain solution, and between the feeding a soothing ointment should be applied.

The amount to be given at each injection is an important factor. As a rule, it should not exceed ¼ of a liter, (½ pint). If this is not well borne, the amount may be reduced to from 30 to 100 c.c. (1–3 oz.).

The number of enemata to be used will depend somewhat upon the patient's constitution; as a general rule, five, or better six, hours should be allowed to elapse between each feeding.

It is well to remember that packing in the vagina and other gynecologic dressings may interfere materially with the injection of fluid into the bowel.

The patient's mouth should be kept very clean, and the patient

may be allowed to rinse it from time to time, to help to allay the thirst, which is usually intense. Under some circumstances water may be taken into the stomach, but where absolute rest of the stomach is indicated, not even that should be allowed. Enemata of weak salt solution may be given to relieve thirst, or salt solution may be given subcutaneously.

A part of the good effect of the nutrient enemata is the mental satisfaction following them, similar to that following a meal. The patient having also the feeling that he is not being allowed to starve.

Prevention of Parotitis during Rectal Feeding.—Fenwick suggests that in order to prevent the occurrence of parotitis, it is well to promote continual secretion of saliva with the idea of irrigating the ducts and so preventing an ascending infection. After experimenting with various things, upon which the patient was directed to chew, he settled on an india-rubber teat about 2 inches in length, with the result that the mouth remained clean and moist. He has used this simple device in more than 300 cases, and where the gland was not already inflamed at the outset he had no trouble in any of his cases. Chewing gum may be used for the same purpose with good results.

INDICATIONS FOR THE USE OF NUTRIENT ENEMATA

Nutrient enemata are indicated:

1. In extremely weakened conditions, as during the progress of fevers, when the quantity of food taken through the mouth is insufficient to sustain life or when even predigested food can not be retained.

2. In diseases of the pharynx and esophagus in which obstructions to the passage of food exist, as from tumors; also occasionally in spasmodic constrictions of the esophagus and in paralytic conditions of the pharynx when the patient is unable to swallow food.

3. In diseases of the stomach, as in cancer occasioning stricture of the cardiac orifice, with inability to swallow sufficient nourishment. In diseases of the stomach in which it is important to relieve the stomach of work—*e. g.*, in carcinoma, in non-malignant strictures of the pylorus with consequent dilatation, and also in ulcer of the stomach, both when hemorrhage has occurred and when liquids are badly borne. In that form of nervous dyspepsia known as irritable stomach, which is accompanied by severe vomiting, nutrient enemata may be given to supply nourishment to the body when the stomach can not retain food.

4. In delirious, comatose, or insane persons who can not be fed through the mouth.

Nutrient Enemata by the Drop Method.—Since Murphy's introduction of continuous proctoclysis by the drop method the administration of nutrient enemata by the same plan has been practised by various clinicians. Eberhard has called especial attention to this

method of treatment. His apparatus consists of an ordinary quart can, inside of which is placed another can holding a pint. These are connected by an 8-inch pipe, which penetrates the bottom of each and projects about 2 inches. A small pet-cock soldered to the base of the outside can allows water to be withdrawn at will. Milk and egg or any other nutriment placed in the smaller can is kept warm and flows freely on account of its being surrounded by hot water. Water at a temperature of 110° to 115° F. seems to answer all purposes. The remainder of the apparatus is the same as used for saline enteroclysis. To insure absorption the bowel must be cleansed by an enema each day. The flow must be regulated to about a drop a second.

A fairly complete list of nutrient enemata as advised by the older writers will be found in the first four editions of this book, and have an historical interest.

The following formulæ are suggested:

1. Milk, pancreatized for twenty-four hours and boiled, 250 c.c. (8 ounces).

2. To the above may be added any of the following, either alone or in any combination:

   1. Dextrose, 5 to 12.5 grams (1½ to 3 drams).
   2. Alcohol, 5 to 12.5 c.c. (1½ to 3 drams.)
   3. Egg yolk, 1 or 2.
   4. Alcohol (50 per cent.), 1 ounce; glucose syrup, 1 ounce; normal salt solution, 6 ounces.

The drop method is especially indicated in persistent vomiting, in hemorrhages, stenosis of the esophagus or pylorus, in carcinoma of the stomach, and in most conditions in which nutrient enemata are ordinarily employed.

At present the best mixtures seem to be normal salt solution to which dextrose and alcohol have been added in the proportion of 5 per cent. Five to 20 drops of tincture of opium are advised by some to be added to a liter during the first day and it is thought that a quarter of a grain of thymol per liter will prevent bacterial change in the bowel. A liter of the above contains 550 calories and may be administered in eight hours under favorable conditions. The formula will be

Dextrose, 50 grams (1⅔ ounces)
Alcohol, 50 grams (1⅔ ounces)
Normal salt solution, 1000 c.c. (32 ounces)

This may be found useful after operations, in acidosis, in diabetic coma, and in many of the indications for rectal enemata.

OTHER METHODS OF NOURISHING THE BODY

Duodenal Alimentation.—Einhorn, Morgan, and others, following the suggestion of the first-named investigator, have used a duodenal tube, not only as a matter of diagnosis, but for feeding certain classes

of cases. At present the tube has been used in those cases in which it was thought desirable to rest the stomach, as in cases of persistent vomiting and in certain gastric and duodenal ulcers. The ordinary Einhorn tube is used, and care should be taken to see that it is in place before the feeding is started. This may be done by gentle traction, which shows a slight resistance if the tube is in the duodenum; by aspiration, which will often bring up golden yellow duodenal juice without any gastric secretion; or, perhaps best, by giving the patient some liquid to drink by mouth and immediately performing aspiration. If the end of the tube is in the stomach, the fluid can be recovered. Any liquid food may be employed, but mixtures of milk, sugar, and raw eggs are the most useful. Care should be taken to see that there are no particles in the food that might clog the tube. The amount at the beginning should be small, 100 c.c. every two hours, beginning early in the morning and stopping late in the evening. This quantity may be gradually increased up to 300 c.c. If 8 feedings are given in twenty-four hours, and each feeding consists of 280 c.c. of milk, 1 egg, and 1 tablespoonful of sugar of milk, the patient will receive approximately 2280 calories, which is ample for an average individual, and if the patient is at rest in bed, it is sufficient to allow a gain in weight.

In some cases Einhorn's diet for duodenal feeding consists of—

7.30 A. M.:	Oatmeal gruel	180 c.c.
	One egg	
	Butter	15 gm.
	Lactose	180 c.c.
9.30 A. M.:	Pea soup	180 c.c.
	One egg	
	Butter	15 gm.
	Lactose	15 gm.
11.30 A. M.:	Same as 9.30 A. M.	
1.30 P. M.:	Bouillon	180 c.c.
	One egg	
3.30 P. M.:	Oatmeal gruel	180 c.c.
	Butter	15 gm.
	One egg	
	Lactose	15 gm.
5.30 P. M.:	Pea soup	180 c.c.
	Butter	15 gm.
	One egg	
	Lactose	15 gm.
9.30 P. M.:	Bouillon	180 c.c.
	One egg	
Total quantity:		
	Oatmeal gruel	360 c.c.
	Pea soup	720 c.c.
	Eggs	8 c.c.
	Lactose	90 gm.
	Bouillon	360 c.c.
	Butter	90 gm.

Einhorn has perfected a special syringe with which it is possible to administer the food without disconnecting the tube. Morgan has

suggested a method like that of Murphy for giving salt solution per rectum, permitting the fluid to flow from an irrigating jar, and so arranging the pet-cock that the food is taken slowly, the 300 c.c. of nourishment taking about twenty-five minutes. The food should be administered at body temperature, and the heating should be done slowly, as if it becomes too hot it is liable to become thick and lumpy. After heating it is well to strain the food to be certain to have it free from small particles. If the food is used too warm or too cold it is apt to cause uncomfortable symptoms, sometimes causing the patient considerable shock; a too rapid administration causes flatulence. After each feeding the syringeful of water, at 98° F., should be injected, then the pet-cock closed, and the syringe filled with air, which should be injected after the pet-cock has been opened; the pet-cock should then be closed and the syringe disconnected. This procedure is very important and serves to keep the tube clean and empty. If this is not done, small masses of food are apt to be drawn into the lower part of the tube, and this may necessitate its removal.

Indications for the Use of Duodenal Feeding.—1. In duodenal alimentation a method of feeding has been established which is not, as a rule, exceedingly uncomfortable to the patient when the technic is properly carried out, and which enables us to maintain nutrition when food cannot be taken in sufficient amounts in the normal way.

2. It is especially useful in the treatment of gastric and duodenal ulcer of a severe type associated with intense vomiting, nausea, and recurrent hemorrhage, and especially those forms which have resisted the usual methods of treatment. By means of this method of feeding the stomach is spared all irritation while healing occurs, and at the same time the requisite degree of nutrition is maintained.

3. Duodenal feeding is of great value in the treatment of cases of atony associated with a maximum degree of prolapse of the stomach and intestines, in which, on account of the anorexia, the patient is unable to take an adequate amount of food, and in which malnutrition with great loss of flesh is produced. This form of feeding is extremely helpful at times in overcoming nervous anorexia and sitophobia, which are often associated with much loss of flesh, strength, and mental depression.

4. It is useful in relieving the vomiting, which may be due to a variety of causes, *i. e.*, nervous vomiting and vomiting of pregnancy.

5. It is a valuable means of cure at times following surgical procedures on the stomach, when nausea, vomiting, and discomfort have recurred some time following operation.

6. Finally, in duodenal alimentation, Einhorn has given us a most valuable method of feeding which in many instances has proved a life-saving procedure, and which may be classed as one of the most useful therapeutic measures developed in recent years.

Food suppositories have been suggested, but their use is open to many objections, the chief one, they may not be absorbed.

Nutrient inunctions, especially with oils, have been suggested, and in conditions of great emaciation they may prove useful. The body is rubbed with oil, such as olive oil, cod-liver oil, or cocoanut oil, or with cocoa-butter. This keeps the skin soft, the massage also proving helpful. It is of particular value in marantic infants, and has been used as a routine practice by the authors in all such cases, with very gratifying results.

Intravascular feeding has been tried out; for the present it is limited to supplying fluid in the form of salt solution, alkalis in the form of sodium bicarbonate solutions, or carbohydrates in the form of glucose solutions (See Acidosis). The problem of intravenous feeding seems somewhat nearer its accomplishment, as Murlin and Riche, in studying fat metabolism, were able to inject 3 per cent. emulsions of lard oil into animals and it was apparently utilized and two Danish observers, Henriques and Anderson, state that they have kept goats alive and in nitrogen equilibrium by furnishing a slow stream of nutrients by injecting into the jugular vein a mixture of glucose, sodium acetate and inorganic salts, together with a solution of meat completely digested with pancreatic trypsin and the intestinal enzyme erepsin. It will doubtless be some time, however, before this method will be available for human beings in a safe and satisfactory form.

Subcutaneous feeding is a subject of considerable interest, and was used as early as 1869 by Menzel and Perko. Karst, Krüg, Witthaker, and others have also employed this method. One of the most important contributions to the subject has been made by von Leube. This observer could obtain no good results from the use of either proteins or of carbohydrates. He is of the opinion, however, that injections of oil are of practical value in nourishing patients under such conditions as render it necessary, as in the failure of rectal enemata because of the presence of hemorrhoids or irritation of the rectum. His attention was directed to the fact that large quantities of oil were used in giving camphor injections, which are more widely used in Germany than in America. Fat emboli result so rarely as to be practically no objection to the method. Von Leube uses the purest olive or sesame oil, and a 10 c.c. syringe, made after the ordinary hypodermatic syringe pattern, or a needle, a tube, and a funnel. From 30 to 40 c.c. (1–1⅓ oz.) of oil may be used daily. The contents of the syringe (10 c.c.) should be injected in three different places and the wounds sealed with collodion. The oil should be injected very slowly, and, of course, the strictest asepsis must be observed.

Lennander, of Upsala, and various others have suggested the use of solutions of glucose, in varying strengths, from 3 to 8 per cent., in

normal salt solution; in some cases from 1 to 2 per cent. of alcohol is also added. These solutions are used under the skin or in the rectum, and as much as 2 liters have been administered in twenty-four hours, giving a total of 160 grams of sugar and 40 grams of alcohol. Kausch has used this solution intravenously, and has recommended it particularly after operations on the abdomen, and especially in suppurative peritonitis. From 100 to 200 grams of olive oil may be injected subcutaneously at the same time, the whole affording a fair amount of available nutritive material. Sugar solutions have also been used locally in the peritoneal cavity in the treatment of suppurative inflammation.

Saline Irrigations and Infusions.—1. **Saline Rectal Irrigations.**—Rectal saline injections are especially useful in all conditions associated with hemorrhage; also in the various infectious diseases, as well as in intoxications and in those conditions in which it is necessary to allay thirst.

The fluid used should be a normal salt solution, and should be given high, with the rectal tube; if it is necessary to prepare such a solution quickly, a teaspoonful of salt may be added to a pint of water, and rapidly injected by means of an ordinary fountain syringe. The fluid should be at about the temperature of the body, and should be administered slowly, while the patient is in a reclining position. As much as ½ to 1 quart of the fluid can be utilized at one time.

The Murphy Method for Administering Solutions by Rectum.—A very useful method of administering salt solutions and other fluids is by the continuous proctoclysis by the drop method as suggested by Murphy. This may be used whenever it seems advisable to increase the amount of fluid in the system. It is of particular service when there has been a loss of blood, and also useful to fill up the system so that further lymphatic absorption is impossible, as after operations about the thyroid. It may also be used when fluids cannot be taken by the stomach. Normal salt solution may be used or the solution advised by Murphy, a dram each of sodium chlorid and calcium chlorid to the pint of water. In cases of great weakness, whisky or an infusion of coffee may be added to the salt solution.

The method of administering the fluid is important. A fountain syringe or a salt solution flask, with a rubber tube attachment terminating in a vaginal hard rubber tip, or a catheter, may be used. After the insertion of the tip or catheter into the rectum, the flask is filled with salt solution and suspended from 4 to 10 inches above the level of the rectum of the patient. The solution is kept in a temperature of 100° F. by surrounding the flask with hot-water bags. An improvement on this is to use one of the simple devices which are on the market for regulating the drop. This may be done by using a funnel, and so regulating the pet-cock on the flask that the fluid escapes a drop at a time. The devices just mentioned are more satis-

factory and require less attention. Care and judgment should be used not to overload the patient with water and so overburden the heart.

Plain Water Injections.—In place of using normal salt solution, ordinary water may be used, as suggested by Lawson, 1908, and more recently by Trout. The advantages of the plain water are that it is absorbed in larger quantities and more rapidly. Patients given salt solution by rectum require nearly twice as much water by mouth to relieve thirst as those given plain water.

The patient does not complain of tasting salt, as is often the case when salt solutions are used. In peritoneal cases in which there is drainage, larger quantities of salt solution or plain water may be used than under other circumstances.

Other Solutions.—Foods of various kinds, as mentioned above, may be administered by this method, and glucose solutions, 30 grams (1 ounce) to the liter of water, or normal salt solution may be used to advantage, especially in cases of threatened or developed acidosis, as in diabetes or following anesthesia.

2. **Saline Infusions.**—Saline infusions are given subcutaneously, and are especially useful in cases in which rectal saline irrigations can not be utilized, as in certain intestinal diseases or when an immediate effect is required, as in sudden collapse from hemorrhage or from shock. They are also useful in cases when large quantities of fluids have been lost by the body, as in the diarrheas of dysentery and of cholera, in various infectious conditions and intoxications, as in pneumonia, erysipelas, and typhoid fever; and in the uremia of chronic Bright's disease. The most convenient location for administering the infusion is between the chest-wall and the mammary gland, or deeply into some muscle, as in the lumbar region, abdominal wall, or buttock. The injection should be given under the most aseptic precautions. No apparatus is required beyond a fountain syringe to which an aspirating needle is attached. The infusion should be warm, and should be allowed to run in slowly; frequently as much as 1 or 2 quarts can be injected into one place. The mixture used is a normal—0.6 per cent.—salt solution. In certain cases Cushing[1] prefers the following solution:

Sodium chlorid	0.900
Calcium chlorid	0.026
Potassium chlorid	0.010
Distilled water	99.064
	100.000

Ringer's solution is also much used:

Sodium chlorid	0.7	per cent.
Potassium chlorid	0.03	"
Calcium chlorid crystals	0.026	"
Distilled water.		

[1] Cohen's Physiologic Therapeutics, vol. ix., p. 289.

Stock solution twenty times this strength:

Sodium chlorid	14	gm.
Potassium chlorid	0.6	"
Calcium chlorid crystals	0.52	"
Water to 100 c.c.		

Add 5 to 95 c.c. of distilled water.

Combs has reported a fatal case of sodium chlorid poisoning. By mistake 1 liter of saturated salt solution was injected hypodermically. When seen four hours later the patient was comatose. After about six hours of coma, a period of excitation followed, she was maniacal, and talked incoherently. This condition persisted for twenty-four hours, when she died—124.4 gm. (1920 gr.) of sodium chlorid had been used.

Intraperitoneal Injections of Fluid.—This is most useful when the fluids of the body have been depleted, as in diarrhea, or where elimination is to be hastened, as in acidosis. It is simpler than intravenous injections, especially in children, and larger amounts of fluid may be administered. Normal salt solution or Ringer's solution may be used. A slight nick is made in the skin, and a short beveled needle inserted in the median line just below the umbilicus or to the left of the rectus muscle at the same level. The fluid should be at body temperature and injected slowly. As much as 250 c.c. may be given at one time to an infant, and it may be repeated several times a day if necessary until the tissues have lost the dough-like consistency and urine is freely secreted. Larger children and adults may be given proportionately larger amounts.

DIET IN DISEASE

General Rules for Feeding the Sick.—The nurse and family should be fully impressed with the importance of the proper feeding of the patient. Definite directions as to how much food, its form, its preparation, and how often it is to be given, should be written out. In all acute serious conditions, as in pneumonia or in typhoid fever, a record of these details should be kept, together with the record of the quantity of fluid taken, the medicines given, etc.

There is usually a tendency to err in either extreme—that of giving either too much or too little food. Care should be taken that the patient's wishes are, wherever practicable, carried into effect. The nurse and family should be questioned carefully as to the patient's likes and dislikes, and also as to his idiosyncrasies. A tactful, observing nurse is of inestimable value, but a careless or stupid one is an ever-present source of danger.

The training of nurses in regard to feeding is often faulty. Every nurse should be instructed in the subject of practical dietetics, and should know how much food is required by the different types of patients. The details of feeding patients should always be gone into.

The food should be given at regular intervals. In unconscious or semiconscious patients this is of great importance, but it is just as important in the conscious, as the appetite usually comes on at certain times, and if the meal is not forthcoming, may disappear.

The appetite of the conscious patient and of the convalescent should be fostered, and nothing done that may in any way disturb it. Patients vary much in this particular, but as a rule individuals who are not overfastidious when they are well, become so when weakened by disease.

The sick-room should be orderly, and no dishes, utensils, or food be allowed to stand about the room either before or after using. All food and drink should be offered from scrupulously clean glasses or dishes. These should be as dainty as possible, and the food must be made attractive in appearance; when the dish permits, it may be garnished with a sprig of green. The napkins and linen should be spotless. The exterior surface of glasses and cups should be wiped dry before they are offered to the patient.

Food that is stale or that has acquired an unpleasant taste from standing in a refrigerator together with other things should not be given. A strong egg in an eggnog may be the means of turning a patient forever against this form of nourishment. The food should be tasted by the nurse, but never, when possible, in the patient's presence or with the same spoon. If there is anything wrong with

a dish, this should be discovered and remedied before it is brought to the patient.

A nurse should always remember the eternal fitness of things. Utensils and dishes should be used only for the purpose for which they are intended, and not as makeshifts for other articles. After caring for the patient or removing evacuations sufficient time should be allowed to elapse before feeding is begun. The patient should be made to feel that the utmost cleanliness and care have been observed. The hands and face of the patient should be wiped with a moist cloth and then dried before food is given, and the lips cleansed after the meal is complete.

The position of the patient should be as comfortable a one as possible, and one in which he will not tire before the meal is ended. If the patient is weak, the food should be given in such form that he may take enough of it without inducing fatigue; otherwise he may become tired of masticating and swallowing and take an insufficient amount. Patients who can sit up in bed should be provided with a bed-tray on which to place the food. The legs should be placed high enough for the patient to eat comfortably from it.

If the patient is helpless, care should be exercised in giving food so that it will not be drawn into the lungs during inspiration or coughing. This may be avoided by giving the food slowly, and by seeing that each mouthful is swallowed before another is given. These patients may be fed in various ways. The food may be given from a spoon, or, what is usually preferred, from a drinking-cup with a spout, or by using a bent tube and allowing the patient to take the food from a glass. When the patient is taking bread and similar solids, great care should be exercised not to allow the crumbs to fall into the bed.

In most severe illnesses it is necessary to awaken the patient during the night to administer food. This is a point that requires special judgment. Often the patient is more in need of sleep than of food. If the patient does not drop off to sleep very soon after taking food, it may be better to wait until he awakens before giving it. As a rule, however, in severe illness the sleep is disturbed for but a few minutes by taking food. A cup of warm milk or similar light food may often induce sleep.

The patient's mouth should always be kept clean. If dry and parched, it should be rinsed before and after taking food. A suitable mouth-wash is given under the heading of Tuberculosis (p. 432), but any of the alkaline mouth-washes may be used; boric acid and water also make an efficient wash. If the mouth is dry, it should be moistened from time to time, and for this purpose a little glycerin, water, and lemon-juice will be found useful. If the patient is helpless, the mouth may be swabbed out with cotton fastened to the end of a stout probe or wound about the finger. This should be moistened with some antiseptic solution.

In all cases where the illness is likely to be protracted, arrangements should be made to care for and prepare the food with as little discomfort to the household as possible. For this purpose a diet kitchen may be improvised, preferably in a room adjoining the patient's. If the patient's means allow, a small sick-room refrigerator should be provided, and a tin receptacle for storing foods that do not need to be kept on ice. A gas or alcohol lamp will serve for heating food. A thermometer, a graduate, a funnel, and filter-papers are needed, and a meat-mincing machine will be found a useful addition. Saucepans, a dish-pan, and a supply of tea towels should also be provided. Boric acid or borax and sodium bicarbonate will help to keep things fresh and clean. In cases of infectious and communicable diseases a covered boiler for disinfecting all dishes and utensils should be added. The dishes should be boiled in water to which 2 or 3 per cent. of sodium bicarbonate has been added, and the boiling should be allowed to continue for fully twenty minutes after the water has begun to boil. Where instructions are likely to be carelessly followed out, it is best to direct that the dishes be boiled for an hour.

Feeding Unconscious and Refractory Patients.—Unconscious patients may often easily be fed by means of a teaspoon. Each spoonful should be swallowed before a second is given. W. Gilman Thompson advises that, in the case of comatose children, the nourishment be poured into the nostril instead of into the mouth. The fluid thus given is swallowed, and any excess returned by the other nostril. If any difficulty is experienced in swallowing, it is best to resort to either the stomach or the nasal tube. With a little practice most patients can be fed with the tube more easily than in any other way. A mouth-gag should be introduced or a roller bandage may be placed between the teeth and held in place by an assistant. In infants who have no teeth this precaution is unnecessary, as the finger answers the purpose perfectly. The tube, previously moistened, is passed into the pharynx and rapidly into the stomach. If the tube is not passed rapidly through the pharynx, contraction may follow and the tube be prevented from entering the esophagus. In order to pass the tube into the esophagus it is necessary to hold it sufficiently well back from the end.

If nasal feeding is to be used, a nasal tube, or in case of infants a catheter, is well oiled and gently passed through the nose into the esophagus and then into the stomach. Care should be taken not to pass the tube into the larynx. This accident can always be avoided by waiting a moment before pouring in the food. Either stomach or nasal tube should be provided with a funnel, and as soon as the tube has been satisfactorily introduced, the nourishment—milk, milk and egg, or whatever liquid food is desired—may be poured slowly into it.

In order to prevent air from entering in advance of the food a small quantity of the food may be poured down the side of the funnel until the tube is full. In many cases it may be desirable to wash

out the stomach before introducing the food. The tube should be withdrawn rapidly, so as not to excite vomiting. Food so introduced may be retained when it would otherwise be vomited. This is true both of infants and adults. (See the sections on Gavage, Forced Feeding in Tuberculosis, and Lavage.)

In the case of refractory patients—the insane, the hysteric, and others who refuse to eat—forced feeding becomes necessary. In this case enough attendants should be present to control the patient. He should be held firmly and the nasal or the stomach-tube be introduced. In order to prevent regurgitation of the food, which some patients manage to do quite skilfully while it is being introduced, the ribs may be tickled. This prevents fixation of the diaphragm, without which the food can not be ejected. This should be done only when occasion demands. (See Diet for the Insane.)

FEEDING IN FEVER

Before directing attention to the diet in special forms of pyrexia it will be well to consider briefly the general dietetic principles involved and their application to this class of diseases.

There existed, in former years, many different views concerning the correct method of feeding fever cases. Prior to the time of Graves (1848) it was the general practice to "starve" fevers. Graves taught that a fever patient required food and should be fed, and in his lectures, published in 1848, there appeared the much-quoted sentence: "If you should be in doubt as to an epitaph to be placed upon my grave, take this—*'He fed fevers.'*" With the teaching of Murchison and others this view gradually replaced the older one, and to-day the profession are in accord regarding the diet indicated in febrile diseases. Minor differences in opinion exist and various theories have been promulgated, but the practical application is the same in all cases.

In fever the metabolic processes are increased, while at the same time the power of assimilation is lowered. This results in the burning-up of the body proteins as well as of the fats. Indeed, it is stated that the proteins suffer a greater loss proportionately than the fats. The appetite is diminished or entirely lost, there is a marked lessened activity in all the glands concerned in digestion, and, as previously noted, absorption and the assimilation of food are much below the normal. Thirst also is much augmented.

Foods appropriate for healthy individuals are not, as a rule, suited for fever patients, and solid foods usually cause vomiting or severe indigestion. In order properly to nourish a fever patient it is necessary that the food be easy to take, easy to digest, and easy to assimilate. Any food that does not possess these three qualities is not suitable for a fever patient. When the disease runs its course rapidly, the diet is of no great importance, for even if the patient take but little food, the period of comparative fasting is a brief one and any

loss is easily made up while recovery is in progress. In protracted diseases, on the other hand, such as typhoid fever, and in chronic fevers, the diet is of primary importance and should be the physician's first care. In chronic diseases and in those fevers where remissions occur, the periods when digestion is comparatively good should be taken advantage of, and the patient nourished and strengthened as much as possible.

In fevers the mouth requires especial care (see Typhoid Fever and Tuberculosis); the bowels likewise should be regulated, and constipation avoided.

In health the amount of food is largely regulated by the supply and kind available and the appetite. In disease the appetite as a guide is apt to be misleading, and either too little or too much food be taken. One must, therefore, be familiar with the food requirements of fever patients. For the average man, weighing 70 kilos or 150 pounds, 33 calories per kilo of body-weight are required, and, consequently, a total of 2300 calories per day. These figures are based on the food requirements of a healthy man at rest. At present we do not know what the requirements of a fever patient are, but it appears that the processes of metabolism are increased, and an increase of about 25 per cent. should be made to cover this. Approximately, 40 calories per kilo may be taken as a standard, and a total of some 3000 calories for the individual of average size (150 pounds). If the patient takes less, it will be made up by the destruction of his body fat and protein, with a consequent loss in weight. It must be borne in mind that the small individuals require less and the large ones more, but the very obese may be regarded as not requiring the full amount for their actual weight, as much of their weight is made up of fat, and this probably does not require the same amount of nourishment as the cells of the body actively concerned with metabolism. Small persons and younger individuals in the growing stages require more food, and the aged less. For the young the requirements will be found under the heading of "Age." Not only must the total quantity of food required be considered, but the amount of protein and other food elements must be taken into account. In adults the amount of protein required daily is more or less fixed, but the amount of carbohydrate and fats will vary with the amount of bodily work performed. If excesses of protein are given, it involves undue wear and tear in katabilizing and eliminating that above the body's needs. Under ordinary circumstances 16 grams of nitrogen daily are required, being the practical equivalent of the 118 grams of protein needed as stated by Voit. Chittenden has shown that even under hard labor a nitrogen equilibrium may be established at even less than half that amount and the individual continue in perfect health. Protein is needed in the body to repair the wear and tear, and in the young for growth. It may also be used for furnishing health and energy, but, owing to what is known as the specific

dynamic action of protein, perhaps not over about 14 per cent. of the total energy should be supplied as protein. The reason for this is that in metabolizing fat and carbohydrates the amount of heat produced is slight and may be disregarded, but protein produces some 30 per cent. of its caloric value in what might be called ''waste heat,'' as it is not used in the functions of the body. It is for this reason that heat and energy are not derived to advantage from giving large amounts of protein, and it explains why the amount of protein food is limited in hot climates, in hot weather, and in fever. Various authorities place the amount of protein needed by the fever patient of average size as between 65 and 100 grams a day. The balance of the number of calories needed may be made up of carbohydrates and fats, which it should be remembered are burned up in the body completely, and are excreted as carbon dioxide and water, or, if not completely oxidized, are stored in the body as fats. The form in which food is to be supplied to fever patients to meet the requirements is a question worthy of careful study.

Milk is almost universally used as a fever diet. It furnishes 35 grams protein to the liter (roughly speaking, to the quart) and about 700 calories (640 to the quart). To get the total food requirements from milk alone, over a gallon a day would have to be used. It is better, therefore, to supply part of the nourishment by using some other food. Milk may, as a rule, be used up to 1½ to 2 quarts a day, supplying some 1200 to 1300 calories per day. But few individuals can digest more than this for any length of time, and even this amount may not be well borne unless it be modified in some way. Suggestions for modifying milk for adults may be learned by considering the methods used in infant feeding. The methods in most common use in invalid feeding are to dilute the milk by adding water, carbonated water, Vichy, lime-water, or a cereal gruel, such as barley or rice gruel. Sodium citrate may sometimes be added, especially if the curd gives rise to difficulties in digestion, or if milk causes constipation. From 1 to 5 grains to the ounce may be used. Partially pancreatized milk may be found of especial value, and buttermilk and whole milk, which has been inoculated with lactic acid bacilli, are both of service, particularly when there is any disturbance of the intestinal digestion. Koumiss, matzoon, and kefir may also be used. Sometimes it is the taste of the milk which is objectionable, and in such cases the milk may be flavored by the addition of chocolate, cocoa, coffee, or some of the numerous recipes given in the Appendix of this book may be used. Malted milk may often be used to advantage, and sometimes various invalids' and infants' foods may be of value.

Cream is of great service, owing to its high caloric value, and it may be added to milk or be taken mixed with cereals. The remainder of the protein may be supplied by using eggs, and from four to six may be regarded as a reasonable number to add to the diet. Eggs

sometimes disagree, but this is more often due to faulty methods of preparation or to the use of cold-storage eggs than to any real egg idosyncrasy. Eggs may be given in numerous ways—raw, with orange- or lemon-juice, or with sherry or brandy, or merely with pepper and salt. Numerous egg and milk drinks can easily be improvised (see recipes for these and the preparation of other foods). If the patient can chew, there is no objection to the use of coddled, soft-boiled or poached eggs, or a properly prepared omelet.

Fruit and fruit juices play a most important part in the diet of fever patients and may be liberally used with benefit in almost all cases. There are some stomach and intestinal conditions in which they may be contraindicated, but even then orange and similar fruit juices may be used to advantage, where formerly they were withheld. Orange, lemon, grape-fruit, lime, grape, apple, and other fruit juices may be used pure or diluted and sweetened. The pulp of the fruit may often be given, as may stewed and baked apples and other stewed or preserved fruits.

Meats are ordinarily not to be used in fevers, although there are exceptions to this rule. They are objectionable chiefly because their use increases the protein content of the food above that limit which has been found by clinical experience to be best for fever patients, and the products of the metabolism of the extra amount of protein add to the work of the already overburdened organism, as protein metabolism in the body is increased already beyond the normal in fever patients. Meat is objected to on account of the purin nitrogen contained, and the excretion of the end-products of these forms of nitrogen entails greater work than a smaller amount of purin-free protein. The purin bodies are also supposed to increase the temperature in fever patients if present beyond a certain amount. Meat, too, is difficult of digestion unless well chewed or freely divided, and many fever patients cannot properly masticate their food. If given at all, it should be freely divided. Meat-juices are sometimes used, especially when little or no food is taken, but it has but a small caloric value. Bouillon and meat extracts may be occasionally used, but, as a rule, they are best avoided. The commercial extracts contain large quantities of extractives which are undesirable for fever patients, and their food value is practically nothing. Fats are to be used with caution, and chiefly as cream and butter and the yolk of an egg. Excessive quantities of fat will cause indigestion in most patients, but small amounts are generally well borne if properly administered.

The remainder of the dietary must be made up of sugar and starches, and these are carefully considered in the article on Typhoid Fever, to which the student is referred for further details of fever diet. Gelatin preparations are often very valuable foods for fever patients.

Thirst is an important symptom in fever patients, and one deserving

of considerable attention. It is to be hoped the cruel treatment of withholding drinks from fever patients, such as was formerly practised, has disappeared, never to return. Thirst is caused by the increased temperature, the increased metabolism, with its coincident increase in waste-products to be excreted, and sometimes apparently by sodium chlorid retention.

If sufficient fluid is not supplied, the tongue becomes coated, the mouth dry, the patient becomes more nervous; if there is delirium, it may be increased, or, if there is coma, it may be deepened. The urine and sweat are both diminished. If fluid is supplied, the patient will pass increased quantities of urine if in cool air, or there may be sweating, due either to the nature of the disease or to the heat. In some diseases thirst follows great abstraction of water from colliquative sweats or watery diarrheal discharges. In cholera and infantile diarrhea there are cases in which the blood actually becomes thick, owing to the great abstraction of water. One of the most important indications for treatment in such conditions is supplying sufficient fluid by mouth or generally by subcutaneous or intravenous infusion. Persistent vomiting may cause similar conditions, and in young infants fever may be induced by withholding fluid, and promptly relieved by supplying it.

If the patient is not getting sufficient fluid with his food, and he generally is not, suitable beverages may be supplied at short intervals. Fluid should be given whether the patient is conscious or unconscious, as even conscious patients may really be in mental states in which they will not ask for even urgent necessities. From 1 to 2 liters (quarts) a day may be regarded as an average allowance for an adult with fever. Further details for giving fluids will be found under the heading of Typhoid Fever.

As a general rule, the physician should see that the patient's bowels are moved at least once daily, and either drugs or an enema may be used, as may be deemed best.

Alcohol.—The question as to the value of alcohol in fevers is one that has been widely discussed. The safest view, probably, is that which takes the middle ground, for while alcohol may have been, and still is, greatly abused in sickness, there can be no doubt that it renders great service, especially as a food and stimulant in fevers. Since alcohol is not needed in all cases, the growing tendency is to restrict its use to those cases in which it is definitely indicated. It should not be employed as a routine measure in any disease, nor should it be used for any length of time where there is a likelihood of the patient acquiring the habit. In acute fevers in strong patients, where the disease is apt to be of short duration, it should not be used. If the odor is apparent on the breath of the patient, or if it causes excitement, delirium, or any mental symptoms, it should be used only in limited quantities.

Alcohol, it should be remembered, is not only a stimulant, but a food as well, each gram of it furnishing seven calories of heat or that equivalent of energy to the body. It should not be given too early in the disease lest its stimulating effect be lost as the system becomes accustomed to it. On the other hand, stimulation, either by alcohol or any other stimulant, should not be delayed too long. As soon as the pulse becomes compressible and weak the stimulant should be administered. When one is sufficiently expert in auscultation, the need for alcohol can be learned from the heart-beat. When the first sound becomes weak or loses its sharpness, it is a sign that the heart is beginning to flag. Sir Dyce Duckworth describes this as follows: "The cardiac indications for the use of alcohol in fever are a notable loss of tone in the first sound, especially if this be inappreciable at the base (Stokes' sign), and the associated condition of the pulse—that of low arterial pressure and the phase of it known as dicrotism."

In hyperpyrexia alcohol is of great value, for when the temperature runs very high digestion and assimilation are apt to come almost to a standstill. In these cases alcohol is easily absorbed and acts as a stimulant and as a food. In continued hyperpyrexia large amounts can be given, and it seems to be entirely used up in the body without producing any mental symptoms.

In the so-called asthenic fevers alcohol in small amounts and at quite frequent intervals is useful. In the very feeble and in the aged it may generally be taken with great benefit.

In prolonged fevers in children attended with difficulty in feeding alcohol is also of value. In these cases the heart indications are usually well marked and are reliable guides to the dosage. In giving alcohol to children it should be well diluted, and small frequent rather than large doses at longer intervals should be administered. Large doses are rarely needed.

In those habituated to the daily use of alcohol it must be given in some form when these persons become ill with fever or, indeed, when confined to bed from any cause. When alcohol is withdrawn suddenly from those accustomed to large daily amounts nutrition rapidly fails and delirium not infrequently sets in.

It should be remembered that many conditions in which alcohol was thought to be indispensable a few years ago are treated just as satisfactorily now without it.

The form in which alcohol is to be given fever patients depends on individual taste. As a rule, pure whisky or brandy diluted with plain or with a mineral water is preferable. If there is a decided preference for wines, a pure old wine, either light or red, may be prescribed.

The quantity to be given depends upon circumstances, and the age, condition, habits, and tolerance of the patient all play an important part in deciding this question. In infants and young children from ½ ounce to 2 ounces of whisky divided over twenty-four

hours may be regarded as a reasonable limit. In older children from 1 to 4 ounces in twenty-four hours, and in adults from 4 to 8 ounces in the same length of time, form a good average. In the case of habitués and also when other circumstances, too numerous to mention here, warrant, these amounts may be increased.

THE FEEDING IN INFECTIOUS DISEASES

DIET IN TYPHOID FEVER

The preceding remarks on feeding fever patients in general should be carefully read before attempting to master the diet for typhoid-fever patients. It should be borne in mind that if one understands the diet in typhoid fever they are prepared to look after the feeding of almost any of the febrile diseases. It should be remembered that the management of the diet in typhoid fever is one of the most important factors in the treatment of the disease. The problem that confronts the physician is the feeding of a patient who is to be ill for weeks, who has a diseased intestine, and whose entire being is deranged by his malady. Owing to the fever and toxemia there is a diminution in the quantity and the quality of the digestive juices. The muscular action of the alimentary tract is often diminished, the liver is more or less disturbed, and the bile less active than normally, and absorption is defective.

It should be borne in mind that the mild case of typhoid needs just as careful watching as the severer one, as there is the same tendency to ulceration and hemorrhage. Indeed, it might almost be said that such complications are as great in what were at first mild cases, owing to the carelessness with which they are dieted.

The aim should be to supply a sufficient amount of food to prevent wasting, and the figures given in the above consideration may be taken as a guide. The form in which the food is supplied will depend somewhat upon the patient, his surroundings, and the ability to supply foods; but in a general way this offers but little difficulty. At times the ingenuity of doctor and nurse will be called upon. The food should be adapted to the patient's digestive powers and, if he is not apathetic, as far as possible, to his tastes. While the old days of starvation have fortunately passed away, we are now swinging to the other extreme, and care should be taken not to overfeed the patient in the endeavor to meet his real or supposed caloric needs. Minor digestive difficulties should be watched for and, if possible, corrected. Any food which causes tympany should be avoided, as the distention of the intestines with gas is one of the great factors in causing hemorrhage. The ulcers may be put on a stretch and the weakened walls of the swollen vessels may be ruptured, and, what is most serious, only partially ruptured, so that the vessel is deprived of the normal power to control and stop the bleeding. It may be made a rule that

any food which produces gas should be avoided; but remember that what causes gas in one patient may not in another, that this gas formation may be due to other factors than food, and that a food that at one time disagrees may later on again be of service. Thus, gas may be caused by the digestion being lessened through reflex action, as by a too long cold bath, or a visit from a too talkative friend, and in numerous ways, which must be carefully considered before eliminating valuable food from the dietary.

How much at a time and how often should food be administered is an important question. The best way to answer this is to figure on the total quantity of food, and then ascertain how much must be given at a time to get in the entire amount in twenty-four hours. Thus, if 48 ounces are given, if the feeding interval is three hours, 7 or 8 feedings could be counted on in the day and night together, and 6 or 7 ounces of food should be given at a time, the latter preferably, as it will then allow a longer sleeping period or periods at night. If the food is well borne and only 6 or even 5 feedings given, the amount must be larger—8 ounces or 9 or 10 ounces being given at a time. Where the total is greater, the feedings must be larger. When the food is taken with difficulty and poorly retained, feeding at two-hour intervals may be used, and 3- or 4-ounce feedings given, or 5 or 6 ounces if the food has been diluted. This question of intervals and quantities must be studied for each individual patient, and varied according to the necessities of the case. It should be remembered that where the food is diluted, either on account of the digestion of the patient or with the idea of the patient's taking more water with the food, as when it is thought desirable to disturb him as little as possible, the quantity given may, as a rule, be greater than it would with the more concentrated foods. When the patient takes his food poorly and is apathetic, drowsy, or comatose, the night and day intervals may be made the same. If the patient takes his food fairly well and sleeps poorly, or has difficulty in getting to sleep if disturbed, then the day intervals may be shortened and the night intervals lengthened.

The question of supplying fluid is an important one. Many patients suffer for want of water, and cannot or do not express their desire for it. If the tongue is dry and crusted and the mouth and lips covered with sores, the patient needs more care and more water, and especially water and acid. Going to the extreme, Cushing and Clarke have suggested as much as a gallon or more water in twenty-four hours, giving it in small definite quantities at short intervals. Copious elimination of urine follows, corresponding to the amount of water ingested. They claim that the patient is more comfortable and that he is less toxic, and that the nervous symptoms are less when large quantities of water are given. This may be partly due to the elimination of the sodium chlorid, which may be retained in larger

quantities than normal in typhoid. Such retention is not apt to be the case in a milk diet, and the objection offered that so much fluid eliminates too many of the body salts is worthy of consideration. The work of pumping the increased amount of fluid is another point to be considered, especially in patients with weak hearts. This question is one for further study. Three or four pints of water a day, in addition to that taken with the food, may ordinarily be regarded as a fair allowance.

Plain water is usually the best, but there may be reasons for changing the drink of the patient. Some patients tire of plain water and like a change; sometimes stimulants, foods, or acids may be thought desirable. Carbonated waters may be given if desired. The natural ones are to be preferred to those artificially charged, and the excessive amounts of gas may be allowed to escape by effervescence before they are given. Sometimes when the stomach is irritable the carbonated waters act as a sedative. The commonest need is for an acid, and water acidulated with diluted phosphate or by hydrochloric acid is of great service. When there is diarrhea, small doses of aromatic sulphuric acid may be given in this way to great advantage. Weak tea, with or without the addition of a little red wine, is a great thirst quencher, but acts somewhat as an astringent. Fruit-juice and water are pleasant when there is no intestinal disturbance, and are also of value if there is constipation. Lemonade, orangeade, grapefruit juice and water, grape juice, raspberry juice, raspberry vinegar, all diluted with water, are most commonly used. These may be utilized as vehicles for administering sugar where desired. Alcoholic beverages may be given if thought desirable. Red or white wines with water, or even sherry or brandy and water, may be relished by some patients. French or Italian vermouth, well diluted with a carbonated water, is often taken to advantage. Under ordinary circumstances old whisky, properly diluted, may be the best alcoholic drink; in some patients it exerts a slight laxative effect; brandy is useful if there is diarrhea, and gin may occasionally be given for its diuretic effect. It may be made into a pleasant drink with lime or lemon juice and a carbonated water.

Coffee is an excellent cardiac stimulant and diuretic, and may be of great service. It does not always agree, and it sometimes causes great wakefulness; but the previous experience of the patient with coffee is usually a good guide. Of the combinations of food and drinks—aside from milk—there are a great many, among which may be mentioned albumin-water, barley-, rice- and oatmeal-water, arrowroot-water, toast-water, gum-arabic-water, and the like.

Coleman and DuBois have determined that foods are oxidized in typhoid approximately as in health, but that the specific dynamic action of protein and carbohydrate is less than in health, but it may be increased during convalescence. Typhoid patients can store body

fat on an abundant diet while losing body weight and protein. The loss in weight and the loss in protein are usually, though not necessarily, parallel. Patients may have a negative nitrogen balance on diets containing more than enough to cover their bodies' needs.

How much food does the patient with typhoid need is a question still under discussion. The requirements generally agreed upon consist of some 40 calories per kilogram of body-weight, or about 3000 calories a day for a patient weighing 150 pounds. Shaffer and Coleman found that on a mixed diet a nitrogen equilibrium could not be established on this amount. When the amounts were increased to 60 to 80 calories per kilogram of body-weight, or a total of 4000 to 5500 calories, the nitrogen equilibrium was established. There were, however, wide variations at different times, even in the same individuals. On the other hand, Grafe, studying the metabolism in typhoid patients who were fasting, only once reached 40 calories per kilo. Further studies will be necessary to explain these various points, and in the meantime the food amounts that are best for typhoid patients will have to be determined clinically. The truth will be found in the fact that food requirements vary with the individual and the character of the disease. Nothing will replace the study of the individual case. In former days there can be no question that fever patients, and especially typhoid patients, were starved, but it is just as important not to overfeed. The individual requirements of a patient—especially in private practice—is a vague thing to many physicians, and a word or two may not be out of place. The general appearance means much. If the patient looks more or less well, it is a favorable sign. If he is anxious or irritable, it may be on account of too little or too much food, or due to gastric or intestinal distress, or, of course, it may be due to many other conditions. Experience or judgment are needed to decide what is wrong. The weight of the patient is the best guide to the state of his nutrition. In many hospitals appliances are to be found for weighing patients in bed, and where these are not at hand the eye must be trained to see and the hand to feel the condition of the tissues, and one soon learns to appreciate whether the patient is gaining or losing. If he is losing, it is a good general rule to try and give more food, if there be no contraindications to this, and there generally are not. The appetite is important, and if the patient is hungry, it is a good plan to try to give sufficient food to make the patient comfortable. If the mouth is coated and dry, fluid and acids should be given. If the tongue and mucous membranes are bright red or scarlet, alkalis, such as Vichy, should be administered. This is rarely the case in typhoid. If the patient is toxic, more fluid should be tried, and this may also be tried in restless and irritable patients.

The ratio of protein, fat, and carbohydrate on which the patient does best cannot be definitely stated at this time, and doubtless varies

both in the patient and the stage and the character of the disease. From 60 to 95 gm. of protein a day have given the best results in cases in which metabolism studies have been made. Purin nitrogen seems to be more apt to raise the temperature, hence foods containing purin nitrogen should be sparingly used during the febrile period. These foods are discussed under the head of Gout. The principal foods containing purin nitrogen are meats, fish, peas, beans, asparagus, onions, mushrooms, and oatmeal. A purin-free diet need not be considered here, but may be borne in mind.

The possibility of feeding fats varies, but Coleman found that they were better borne when the temperature began making wide remissions and during convalescence. Cream and butter have been used in considerable quantities, and with apparent benefit. Carbohydrates have been found to be of especial value in supplying the needs of typhoid patients, and it would seem that a very considerable amount of the daily food may consist of carbohydrates, especially so when high caloric diets are used.

We now come to the choice of foods and the actual amounts that may usually be given. Milk has always been, and doubtless will always continue to be, a favorite food in typhoid fever. This topic has often been the subject of debates. Suffice it to say that practical experience demonstrates that milk may be taken in large quantities, and generally to advantage. Bear in mind that a satisfactory typhoid diet may easily be arranged without milk, should it be thought desirable to do so. Some patients cannot take milk without gastric or intestinal disturbance, but those people in whom actual milk idiosyncrasy exists are the exception. Milk generally agrees if properly modified. It may cause tympanites, it may cause diarrhea, and sometimes it may cause gastric indigestion. When any of these occur, it should be omitted from the diet for a day or two, and then started again, using some different modification. The methods of modifying milk in the diets for fevers have been fully discussed above. The quantities used in typhoid may be put down at from 1½ to 2 liters (quarts) in twenty-four hours. To this may be added 250 c.c. (½ pint) of 20 per cent., or 16 per cent. cream, should it be desired to increase the calories by using milk. Sometimes as much as 3 liters (quarts) of milk may be used, but there are not many patients who can digest that amount for any length of time. Children are more apt to take milk over long periods of time without untoward effects than adults. We have used milk very largely at the Robert Garrett Hospital for Children, in Baltimore, and it agrees admirably in most cases. For years we used it almost exclusively, but in recent years we have been inclined to a more liberal dietary. Kerley believes that the milk diet used in children is largely responsible for the comparatively high mortality, but we cannot agree with him. Bad results may be noted at times, but they are usually the result of unskilful

feeding, and not to the milk itself. High calorie diets are, as a rule, not well borne by the very young.

Eggs may be used in typhoid fever to advantage. We formerly taught that eggs were not well borne, but this statement applies only to cold-storage eggs. Only fresh eggs should be used. Eggs may be given as albumin-water, or the whole raw egg may be shaken up with milk, or with other articles of food, into palatable drinks. Coddled eggs, soft-boiled eggs, or poached eggs may also be used if the patient is sufficiently well to masticate them. From four to six eggs may be given daily. Meats are not suitable for typhoid patients. They contain too much nitrogen, and this in itself is liable to upset the metabolism. Meat is objectionable on account of its so-called dynamic action, and also because of the purin nitrogen which it contains. Beef-juice may be given in exceptional cases, and bouillon or beef extracts may be used as appetizers, but they contain too little nutriment to be of any value. During convalescence meats are of great value, and fat may be given as the yolk of eggs, six yolks a day being the maximum average. Cream may be used to advantage, and butter may also be given. Too high fat always causes trouble, and its use should be carefully watched.

The carbohydrates allowable consist of the various sugars and starches. Of the sugars, cane-sugar and milk-sugar may be used to greater advantage than any of the others. Cane-sugar is so sweet that scarcely more than a tablespoonful can be added to 6 or 8 ounces of milk, lemonade, coffee, and similar drinks. Milk-sugar is not so sweet, and is well borne, as a rule. In children with diarrhea it should be used cautiously, if at all. Several tablespoonfuls may be given at a time if desired. It should be given in lemonade or coffee or in milk, as suggested below. Starches are best given as cereal gruels, toast, zwieback, and crackers. Starchy foods for typhoid patients should contain little or no cellulose, and should be as free from water as possible. They should always be well cooked and prepared, so as to be palatable and easy of digestion. Starches are bulky foods at best.

Malted milk is a valuable food in some cases, especially in difficult ones, and particularly so in children who take milk and other foods poorly. The proprietary foods, consisting of beef and alcohol, should not be used except now and then when everything seems to disagree or pall.

Alcohol may be used according to the rules laid down for fevers in general.

The following suggestions as to caloric values will be found of value in arranging dietaries. The figures are approximate:

Milk, 1 liter (quart)	650.0
Milk, 30 gm. (1 ounce)	20.0
Cream, 20 per cent., 500 c.c. (1 pint)	1000.0

Whey, 30 gm. (1 ounce)	10.0
Buttermilk, 30 gm. (1 ounce)	10.0
Condensed milk, 30 gm. (1 ounce)	132.0
Whole egg	80.0
White of egg	30.0
Yolk of egg	50.0
Cane-sugar, 30 gm. (1 ounce)	116.0
Milk-sugar, 30 gm. (1 ounce by weight)	116.0
Milk-sugar, 20 gm. (1 ounce by volume)	72.0
Milk-sugar, 9 gm. (1 tablespoonful)	36.0
Barley flour, 30 gm. (1 ounce by weight)	100.0
Rice flour, 30 gm. (1 ounce by weight)	100.0
Boiled rice, 1 tablespoonful	60.0
Toast, average slice	80.0
Toast, thick slice	100.0
Bread, average slice	80.0
Bread, thick slice	100.0
Crackers, 1 ounce	114.0
Apple-sauce, 30 gm. (1 ounce)	30.0

Further suggestions will be found in Roberts' tables of the caloric value of household measures of foods (p. 93), and in the table of caloric values of common foods per ounce (p. 94).

Irving Fisher has suggested that the labor of computing diets can be much simplified by serving foods in standard portions of 100 calories each, and his table, showing the amounts, together with the number of calories furnished by protein, fats, and carbohydrates, will be found elsewhere in this volume.

In making up the dietary for the typhoid patient the following foods should be borne in mind, while additional ones will suggest themselves by looking over the recipes at the end of the book:

Milk.
Cream.
Buttermilk.
Whey.
Junket.
Matzoon.
Kumiss.
Cocoa.
Chocolate.
Ice cream.
Malted milk

Soups.—Beef, veal, chicken, tomato, potato, etc. These may be thickened with rice, barley, arrowroot, wheat flour, or with egg or milk. Well-boiled rice, sago, or barley may also be used.

Raw eggs.
Yolk of egg.
Custards.
Egg and milk.
Stokes' brandy-and-egg mixture.
Egg-nog.
Milk-toast.
Crackers and milk.

Well-cooked cereals, such as rice, barley, cream of wheat, sago, arrowroot, cornmeal.

Soft puddings.
Blanc mange.
Cornstarch pudding and similar preparations.
Thoroughly cooked macaroni or spaghetti.
Apple-sauce, lemonade, orangeade.
Gelatin jellies.

Scraped meat, raw or boiled, given with care and only in small amounts.

Oatmeal is ordinarily not suited as a food for typhoid fever patients, but sometimes is used. It should be cooked five hours and strained.

Pea-soup and bean-soup have been suggested, but ordinarily are objectionable on two grounds—the purin nitrogen contained and their great tendency to cause flatulence in some patients.

Baked or mashed potatoes may be used sparingly.

High Caloric Diet.—Shattuck, of Boston, has long advocated more liberal feeding in typhoid patients, and Coleman and Shaffer have experimented with it extensively. The following is largely taken from Coleman's article in the American Journal of the Medical Sciences for January, 1912: We have gone into the subject in considerable detail, as it shows what can be done practically in high caloric feeding, and a careful study of the method teaches many lessons in fever feeding. If the patient is sufficiently well to take notice, he can be told that the more he eats the better, and that he may ask for articles of diet which may be allowed if they are suitable. The large quantities of milk-sugar suggested are often well taken in one food and objected to in another. During the first few days of observation milk may be used and then the diet gradually increased. During the early stage 3000 calories may be about all the patient will take; later, the amount may be increased to 4000 or 6000 calories. If the patient has any great amount of discomfort or shows symptoms of indigestion or of malassimilation of the food, the amount should be decreased at once. Any form of food that disagrees should be discontinued, lest the disturbance so caused should interfere seriously with the future feeding of the patient.

Coleman's Milk, Cream, and Lactose Diets.

	Calories.
For 1000 calories a day:	
Milk, 1 quart (1000 c.c.)	700
Cream $1\frac{2}{3}$ ounces (50 c.c.)	100
Lactose, $1\frac{2}{3}$ ounces (50 gm.)	200
This furnishes eight feedings, each containing:	
Milk, 4 ounces	80
Cream, 2 drams	15
Lactose, 6 grams	24
For 1500 calories a day:	
Milk, $1\frac{1}{2}$ quarts (1500 c.c.)	1000
Cream, $1\frac{2}{3}$ ounces	100
Lactose, $3\frac{1}{3}$ ounces (100 gm.)	400
This furnishes six feedings, each containing:	
Milk, 8 ounces	160
Cream, 2 drams	15
Lactose, 16 grams	64
For 2000 calories a day:	
Milk, $1\frac{1}{2}$ quarts	1000

Cream, 8 ounces (240 c.c.)	500
Lactose, 4 ounces (125 gm.)	500
This furnishes seven feedings, each containing:	
Milk, 7 ounces	140
Cream, 1 ounce	60
Lactose, 18 grams	72

For 2500 calories a day:

Milk, 1½ quarts	1000
Cream, 8 ounces	500
Lactose, 8 ounces (250 gm.)	1000
This furnishes seven feedings, each containing:	
Milk, 7 ounces	140
Cream, 1 ounce	60
Lactose, 36 grams	144

For 3000 calories a day:

Milk, 1½ quarts	1000
Cream, 1 pint (480 c.c.)	1000
Lactose, 8 ounces	1000
This furnishes eight feedings, each containing:	
Milk, 6 ounces	120
Cream, 2 ounces	120
Lactose, 1 ounce (30 gm.)	120

For 3900 calories a day:

Milk, 1½ quarts	1000
Cream, 1 pint	1000
Lactose, 16 ounces (480 gm.)	1900
This furnishes eight feedings, each containing:	
Milk, 6 ounces	120
Cream, 2 ounces	120
Lactose, 2 ounces	240

Coleman suggests the following diet:[1]

	Hours.	Total.	Calories.
Milk, 6 ounces	9, 11 A. M.; 3, 7 P. M.	1260 c.c.	860
Cream, 2 ounces	10 P. M.; 1, 4 A. M.	420 c.c.	840
Lactose, 10 grams.		70 gm.	280
			1980

At 11 A. M.:

	Calories.
Egg, 1	80
Mashed potato, 20 gm.	20
Custard, 4 ounces	250
Toast (or bread), 1 slice	80
Butter, 20 gm.	150
Coffee.	
Cream, 2 ounces	120
Lactose, 20 gm.	80
	780

At 5 P. M.:

	Calories.
Egg, 1	80
Cereal, 3 tablespoonfuls	150
Cream, 2 ounces	120
Applesauce, 1 ounce	30
Tea.	
Cream, 3 ounces	180
Lactose, 20 gm.	80
	640

At 7 A. M.:

	Calories.
Egg, 1	80
Toast, 1 slice	80
Butter, 20 gm.	150
Coffee.	
Cream, 2 ounces	120
Lactose, 2 gm.	80
	510

[1] Which contains 3910 calories, and may be modified as desired.

The following contains 5580 calories:

	Hours.	Total.	Calories.
Milk, 5 ounces	9, 11 A. M.; 3, 7 P. M.	1200 c.c.	820
Cream, 2 ounces	10 P. M.; 1, 4 A. M.	720 c.c.	1440
Lactose, 15 gm.		120 gm.	480
			2740

At 11 A. M.:

	Calories.
Eggs, 2	160
Toast, 2 slices	160
Butter, 20 gm.	150
Mashed potato, 70 gm.	70
Custard, 8 ounces	500
	1040

At 5 P. M.:

	Calories.
Egg, 1 slice	80
Toast, 2 slices	160
Butter, 20 gm.	150
Cereal, 6 tablespoonfuls	290
Cream, 4 ounces	240
Applesauce, 1 ounce	30
Tea.	
Cream, 2 ounces	120
Lactose, 20 gm.	80
	1150

At 7 A. M.:

	Calories.
Egg, 1	80
Toast, 2 slices	160
Butter, 20 gm.	150
Coffee.	
Cream, 3 ounces	180
Lactose, 20 gm.	80
	650

The following diet contains 5570 calories, and is suitable for convalescents:

	Hours.	Total.	Calories.
Milk, 5 ounces	9, 11 A. M.; 1, 7 P. M.	1050 c.c.	700
Cream, 3 ounces	10 P. M.; 1, 4 A. M.	630 c.c.	1260
Lactose, 15 gm.		105 gm.	420
			2380

At 11 A. M.:

	Calories.
Eggs, 2	160
Mashed potato, 80 gm.	80
Custard, 8 ounces	500
Creamed chicken, 1 ounce	50
Toast, 2 slices	160
Butter, 20 gm.	150
	1100

At 5 P. M.:

	Calories.
Toast, 2 slices	160
Cereal, 6 tablespoonfuls	290
Cream, 2 ounces	120
Lactose, 20 gm.	80
	650

At 3 P. M.:

	Calories.
Lemonade (lactose, 120 gm.)	480

At 7 P. M.:

	Calories.
Egg, 1	80
Cereal, 5 tablespoonfuls	250
Cream, 2 ounces	120
Toast, 2 slices	160
Butter, 20 gm.	150
Coffee.	
Cream, 2 ounces	120
Lactose, 20 gm.	80
	960

The following valuable recipes were arranged by Miss Edna Cutler, and are from Coleman's article:

Cocoa with milk:

	Calories.
1 rounding teaspoonful of cocoa	50
2 ounces of milk-sugar	240
4 ounces of milk	80
2 ounces of cream	120
	490

Mix the sugar with the cocoa; cook in the milk until dissolved. Serve with the cream.

Cocoa:

	Calories.
1 heaping teaspoonful of cocoa	50
2 ounces of milk-sugar	240
½ cup of water.	
3 ounces of cream	180
	470

Mix the cocoa and sugar, add the water, and boil. Then add the cream, or use less cream and serve with whipped cream.

Coffee:

	Calories.
1½ ounces of milk-sugar	180
4 to 5 ounces of strong coffee.	
2 ounces of cream	120
	300

Plain junket or rennet custard:

	Calories.
25 gm. (1 ounce) of milk-sugar	100
5 ounces of milk	100
¼ junket tablet.	
1 ounce of cold water.	
Few drops of vanilla.	
	200

See directions for cocoa junket.

Cocoa junket:

	Calories.
1 teaspoonful of cocoa	50
25 gm. of milk-sugar	100
5 ounces of milk	100
¼ junket tablet dissolved in 1 ounce of cold water.	
	250

Mix the cocoa and sugar, add the milk, and heat lukewarm, stirring constantly; add the dissolved junket, stir thoroughly, and leave it in a cool place to set.

Soft custard:

	Calories.
1 cup of milk	160
1 egg	80
2 ounces of milk-sugar	240
Speck of salt.	
2 to 3 drops of vanilla, or caramel made of 3 tablespoonfuls of granulated sugar	20(?)
	500

Beat the egg slightly, add the sugar, salt, and hot milk slowly. Cook in a double boiler, stirring constantly, until it thickens a little (if cooked too long,

the custard will curdle, but may become smooth again if set in a dish of cold water and beaten at once). Flavor and cool.

To make caramel: Put the sugar in a pan directly over heat and burn until a very dark brown. Dissolve in hot water or milk.

Baked custard:

	Calories.
1½ ounces of milk-sugar	160
6 ounces of milk	120
1 egg	80
Nutmeg or vanilla.	
Speck of salt.	
	360

Beat the egg slightly. Warm the sugar and milk, stirring constantly, add to the egg, strain into a custard cup, and flavor. Bake in a pan of water in a moderate over until a knife when cut into it will come out clean (thirty minutes to one hour).

Bread pudding:

	Calories.
1½ ounces of milk sugar	180
6 ounces of milk	120
1 egg	80
1 slice of bread (⅜-inch thick)	60
½ ounce of butter	120
	560

Spread the bread with butter and cut into squares. Beat the egg slightly; heat the milk and sugar, stirring constantly; mix with the egg and pour over the bread. Grate nutmeg over the top, and bake the same as the custard.

Vanilla ice cream:

	Calories.
4 ounces of cream	240
2 ounces of milk	40
2 ounces of milk-sugar	240
Speck of salt.	
Few drops of vanilla.	
	520

Mix the cream, the milk, and sugar, and heat, stirring constantly, until the sugar is dissolved. Then flavor, cool, and freeze.

Lemonade:

	Calories
4 ounces of milk-sugar	480
7 ounces of cold water.	
2 tablespoonfuls of lemon-juice (or to taste).	
	480

Boil the sugar and water for two minutes, add lemon-juice to taste, strain, and cool.

Care of the Mouth.—This is of primary importance. If begun early and persisted in, many undesirable mouth conditions can be avoided. If the mouth is in good condition, the patient can, as a rule, take his food easily; if it is not, the greatest difficulty may be experienced. After each feeding the mouth should be cleansed carefully, a proceeding that should never be neglected. If the patient is strong enough, he may rinse the mouth with a mild antiseptic solution —the prescription given in the section on Tuberculosis is an ad-

mirable one. Boric acid solutions to which a little glycerin and lemon-juice have been added or one of the prepared mouth-washes diluted with water may be used; diluted hydrogen peroxid is also serviceable. If the patient is too weak to do this, the nurse should swab the mouth. The physician should assure himself that the nurse is carrying out his orders in this regard, for careless nurses are often apt to neglect this. The use of chewing gum is of value in keeping the mouth in good condition.

Diet in Digestive Disturbances.—In cases where the food is rejected or badly borne it is necessary to give the stomach absolute rest for several hours or more. Then very small quantities of egg-water, barley-water, and lemon-juice, or similar preparations, may be given. Panopepton and the liquid beef preparations are useful in this condition, and may be served with cracked ice or diluted with water. Weak tea or red wine and water in small doses are useful, especially if there is diarrhea.

Diarrhea is often caused by the use of milk in which there are large numbers of bacteria. Where diarrhea persists, the milk used should be examined and sterilized or pasteurized milk used. The effect of using pasteurized milk in such cases is often very striking, as has been shown by Edsall.

For the diarrhea an ice-bag to the abdomen has been highly recommended, but is seldom well borne. Instead, cloths moistened with cold water may be used.

For the painful and troublesome accumulation of gas in the intestine either the ice-bag or the cold applications may prove beneficial. The authors have obtained excellent results from the use of turpentine stupes, but these have failed in the hands of many physicians. When the meteorism is due to the imperfect digestion of starch, the carbohydrates should be reduced or withdrawn; when it is due to milk, the form in which this is given should be changed or it should be withdrawn altogether for a time.

Hemorrhage.—When hemorrhage from the bowel occurs, the intestinal tract should be given absolute rest for a number of hours. An ice-bag, cold applications, or a cold-water coil should be placed upon the abdomen. To relieve the thirst the patient may be allowed to suck small bits of ice, or ice-cold water or cold tea may be given in spoonful doses. After some hours the patient may be given a teaspoonful of cold milk, and this may be repeated every two or three hours. Beyond this, if the bleeding is severe, the intestinal tract should be given complete rest for twenty-four hours or longer. Opium or morphin may also be used. The return to the regular fever diet should be made gradually and with caution.

Perforation.—When perforation occurs, all food should be discontinued and surgical treatment instituted, or where this is not possible, large doses of morphin or opium may be prescribed. Following

operation the diet will be that of any bowel perforation that has been operated upon. If the patient rallies without surgical intervention, or when this has been found impracticable, food may be given after an interval of twenty-four hours, but only in very small quantities at sufficiently wide intervals. It is best to begin with teaspoonful doses every three hours, and if the food is retained, this may gradually be increased. Usually food is rejected, and when this is the case, the stomach should be given complete rest, for feeding only tends to aggravate the condition.

Convalescence.—The diet during the first weeks of convalescence requires as much care and attention as it received throughout the febrile period; in fact, since these patients often develop a ravenous appetite, born of several weeks' milk diet and fever, even greater care is necessary. The patient's wishes should in nowise govern his diet, and relatives and friends should be cautioned against giving the patient anything not ordered by the physician. Many a relapse and death has been caused by the misguided kindness of friends and relatives in this respect.

When there has been severe bowel disturbance, the patient is to be kept on a liquid diet until the ninth or tenth day of the afebrile period. After mild cases, where there has been but little bowel disturbance, changes may be made in the diet after the fifth or sixth afebrile day. In these mild cases the greatest caution is required, as they are often quite as apt to do badly as are the severe ones, and the attendants are much more likely to be careless in carrying out instructions.

The first addition to the dietary should be made by giving a piece of zwieback over which hot milk or cream has been poured. If desired, milk-toast, milk and crackers, or junket may be substituted for this. If this is well borne, other articles, such as soft-boiled eggs or the soft part of oysters if they are in season and can be obtained fresh, may be added from day to day. Thickened meat broths containing well-boiled rice or vermicelli may be given. Finely scraped raw beef, reduced to a pulp in the manner suggested for tuberculosis patients, also lends variety.

Tender meats, vegetables, and bread-stuffs in increasing quantities may be allowed. Roast chicken, squab, or partridge, boiled (white) fish, such as trout; of the vegetables, spinach, cauliflower tops, asparagus-tips, purées of peas, carrots, or tender string-beans or artichokes, well-cooked rice, and baked potato mashed and served with cream or dish gravy; toast, zwieback, crackers, and the crust of bread may all be permitted. If the condition of the bowel permits, fruit-juices may be allowed, as well as a baked apple, apple-sauce, or junket flavored with fruit. Other sick-room delicacies may be ordered at the discretion of the physician. Chops, tender steak, and roast beef may generally be given in the third afebrile week (very finely divided

meat may be allowed much earlier), and the diet gradually changed until the ordinary diet is resumed. For some time after an attack of typhoid the patient should be instructed to exercise care in the selection of his diet, and especially to avoid all food such as green fruit, green corn, crabs, and the like, that is likely to cause diarrhea.

The following menu for the first week of convalescence may serve as a guide to the inexperienced physician, and may be altered to suit the individual case. It may be begun about the fifth or sixth afebrile day in mild cases, and about the ninth or tenth in severe cases. Milk should form the bulk of the diet at this period.

First Day.—Milk-toast or zwieback covered with hot milk or cream or crackers and milk. Beef-juice.

Second Day.—Chicken broth thickened with rice or vermicelli. (The rice should be boiled thoroughly.) Soft parts of several oysters, or a very lightly boiled egg.

Third Day.—Junket, a meat broth thickened with well-cooked barley (boiled at least three hours), with barley flour, or with stale bread-crumbs. Wine-jelly. Scraped raw beef.

Fourth Day.—Lightly boiled or poached egg. Arrow-root, barley gruel, or milk-toast. Chicken-jelly.

Fifth Day.—Junket, a little well-boiled rice with a small amount of finely divided roast chicken, squab, or partridge, preferably the white meat. Apple-sauce if bowels permit.

Sixth Day.—Scraped beef, poached egg, calves'-foot jelly. A baked custard. A piece of toast or zwieback.

Seventh Day.—A small piece of finely divided broiled chop or steak, baked potato. A baked apple. Well-boiled rice and cream for breakfast. Junket for supper.

ATYPICAL TYPHOID—COMPLICATED TYPHOID

There are two classes of cases in which especial attention to the diet is required. These are: (*a*) atypical typhoid, cases where the fever persists for weeks as practically the only symptom; and (*b*) those cases that have run their course, but where, owing to some complication, most frequently the presence of pus, the fever remains high.

The first class are often associated with extreme emaciation, and the fever may be regarded as a true inanition fever. In others the emaciation may not be extreme, but the fever may persist, and may not disappear until the patient is allowed to sit up. In these cases, after sufficient time has elapsed for healing of the intestinal ulcerations to take place, and if there are no other symptoms forbidding it, the diet may be increased in the same way as during an ordinary convalescence. If an exacerbation of the symptoms occurs and the fever increases, it is an indication that too much food is being given.

In the second class of cases there may be extreme emaciation, with

the development of abscesses or furuncles. These patients may be benefited by an increase in the diet, for some of them do not seem to be able to assimilate sufficient nourishment from the food-supply to make up for the waste.

In any case where there is fever the diet should be watched carefully and no changes be made unadvisedly.

TYPHUS FEVER

The diet in this disease is the same as in all acute fevers; typhus requires no especial precautions, such as are needed in typhoid. During the acute stage of the disease the diet should be liquid, milk being best. When this is not well borne, liquid substitutes, such as are used in typhoid, may be given. The food should be administered at regular and sufficiently frequent intervals—every two, three, or four hours, according to the quantity the patient is able to take at one time. A quart of milk and a pint of animal broth may be considered a fair amount of food for one day. Water should be given freely.

Curschmann calls attention to the fact that eggs are better borne in typhus than in typhoid, and recommends that several be given every day. He also advises the use of solid food, even during the period of fever, if the patient is able to masticate and swallow. He allows rolls, zwieback, chicken, and chopped meat.

As a rule, the patients require a supporting and a stimulating diet from the outset. Alcohol may be given when the pulse and the general condition demand its use. Black coffee, especially when there is a tendency to stupor, is also to be recommended.

Complications are treated in the same way as when they occur in typhoid. During convalescence the diet should be increased as rapidly as possible, the usual care being observed (see the section on the Diet in Fevers). Alcohol in some form is generally necessary at this time. The form in which it is to be given may be governed by the patient's taste, and the amount should be carefully regulated by the patient's condition.

SMALL-POX

The diet in small-pox is similar to that recommended in other acute fevers. The only point to be noted especially is that the supporting diet should be begun early, as in the severe cases the extensive suppuration makes a large drain on the patient's system.

During the first stage of the disease there is little desire for food. The diet should be liquid, and consist of milk, broths, albumin-water, and the like. Intense thirst is generally present, and this may be relieved by water, lemonade, or the carbonated waters.

When the initial fever subsides and the patient feels improved, it

is well to allow any light nutritious food he may desire—milk, eggs, chops, steak, or rare roast meat; bread or toast; and the more easily digested vegetables, such as well-cooked potato, spinach, celery, asparagus-tips, cauliflower tops, and the like are all suitable.

When the second period of fever comes on, a return to the liquid diet may again be made. The diet should be as ample as possible, and the food be given at regular intervals every two or three hours during the day and every three or four hours at night. Milk, plain or peptonized, milk-punch, raw eggs, egg and sherry, and the various combinations and dishes made of eggs and milk should be given. Broths, beef-juice, and the like may also be added (see Recipes in Appendix). When there is marked dysphagia, as there is apt to be in all severe cases, the food is best given cold, at more frequent intervals, and in smaller quantities. Rectal feeding may be resorted to in some cases.

In severe cases alcohol is required, and may be given from time to time as the condition of the patient demands. Whisky, brandy, and port wine are, as a rule, borne best; the whisky or brandy should be given in diluted form, combined with a small amount of glycerin or syrup to avoid irritating the throat. Stimulants may be added to the milk, or they may be given in the form of milk-punch or egg-nog, according to the patient's taste. Alcohol should not be given as a routine practice in all cases, as was formerly done. Mild cases and even those of moderate severity, in patients under twenty, usually require little or no stimulation.

During the convalescence the diet may be increased rapidly. As soon as the fever declines, meat may be added to the dietary, and when the appetite and digestion allow, other articles of diet may be given.

SCARLET FEVER

Some difference of opinion exists regarding the value of diet in preventing nephritis in scarlet fever. A careful study of these cases, however, has led to the belief that a strict milk diet during the height of the disease and a mixed milk and farinaceous diet during convalesence are by far the safest. Ziegler, reporting an experience of twenty-one years with 231 cases kept on an exclusive milk-diet, did not have a single case of nephritis. Previous to that time, on a mixed diet, half his cases developed nephritis. After a number of years of favorable experience with the use of milk diets in scarlet fever, we have come to the conclusion that while the diet is effective in preventing the late cases of nephritis, it is difficult to use in many cases. We have recently been more liberal—allowing farinaceous foods and almost any purin-free food low in nitrogen. So far we have not had any untoward results. A list of the purin-free foods will be found under the heading of Purin Metabolism. The milk should be diluted with

lime-water or with a carbonated water; if it disagrees, it may be peptonized, either partially or completely. Kumiss or buttermilk, particularly the former, may be given as a change. Although they may refuse it at first, children often learn to like kumiss. If milk becomes distasteful or disagrees, it may be mixed with barley-water or arrow-root gruel, or these may be given plain. Oyster or clam broth, the oysters or clams having been strained out, makes a pleasant change.

For the thirst, which is generally great, plain or carbonated waters, barley-water, orangeade, or lemonade may be given freely. A level teaspoonful of cream of tartar stirred into a glass of lemonade is a useful diuretic drink if albuminuria is present.

Plain vanilla ice-cream or a plain lemon ice may be given in small quantities. Finely shaved ice, also in very small quantities, and flavored with a little lemon- or orange-juice, often makes a most grateful addition if angina is marked.

Jaccoud and Baginsky insist that scarlatinal nephritis may generally be averted if a milk diet is adhered to for several weeks in all cases. It is a good plan to let the diet in all cases be as simple as possible for three weeks, and then to make additions to it from day to day. If there is albuminuria or nephritis, a milk and farinaceous diet, as recommended in nephritis, should be adhered to. If there has been a severe albuminuria, without casts, or if symptoms of nephritis have appeared, the diet should be liquid for a month or six weeks, the urine being carefully watched in the meantime. Owing to carelessness in regard to the diet, mild cases of scarlatina may be followed by severe nephritis.

In all cases the diet should be gradually increased from day to day during convalescence; the following may serve as a guide to the order in which this increase may be made: Milk-toast, junket, custard, farina pudding, oranges, rice-pudding, baked apple, bread and milk, sago or tapioca pudding, with or without apple, corn-starch pudding, boiled custard.

The return to meat is best made by allowing a small quantity of boiled or baked fish, the soft parts of oysters, very soft-boiled eggs first and then the lightest and most easily digested meats, chicken, raw or very rare beef in minute quantities, and the like.

During the height of the disease and throughout convalescence meat-extracts should be avoided, as they contain large quantities of meat extractives, which are liable to irritate the kidneys.

Rest in bed should be insisted upon until the fever has been absent at least a week. In mild cases of scarlet fever stimulants are not required; but in the severe cases, where there is adenitis, marked angina, or sepsis, alcohol may be used as the heart and general condition indicate the need of it. (See Alcohol in Fevers.) Strychnin and digitalis are also useful.

MEASLES

In measles the diet is similar to that of any acute fever. The food of infants, if bottle-fed, should be more dilute than usual; for older children an exclusively liquid diet is indicated.

Milk, soups, and broths may be allowed, and these may be peptonized if necessary. The food should be given at regular intervals, these depending on the amount given at each time—generally two, three, or four hours apart.

Thirst may be allayed by water, plain or carbonated, orangeade, lemonade, and the like. The return to a solid diet should be made gradually. Alcohol may be used if necessary. When gastro-intestinal disturbances supervene, they should be treated in the customary way. (See Feeding in Fever.)

MUMPS

While fever or swelling exists the diet should be liquid. During convalescence some solid food may be taken. Care should be observed to avoid all acids and astringents, as these may cause extreme discomfort and even intense pain.

WHOOPING-COUGH

In all cases of whooping-cough the diet and the bowels require the closest attention.

If the child has any tendency to the so-called "mucous disease" or to intestinal disturbance, this is almost sure to manifest itself during the course of the disease, as all the mucous membranes are apparently affected. Attacks of indigestion and the abdominal distention that usually follows may increase the number of paroxysms. There is always a tendency to vomit. This usually occurs with or after the paroxysms of coughing, but the pharynx may become so irritable that vomiting may be excited by the taking of food, drink, or medicine. Any drug that tends to produce nausea should carefully be avoided.

The diet for children under two years of age should be fluid. Milk, diluted with lime-water or a carbonated water, or peptonized, should be the mainstay. Broths, albumin-water, and barley-water are also useful. In children who are weak or in whom vomiting is severe, some of the predigested liquid beef preparations, well diluted with water, may be given. These are stimulating and contain considerable nutriment.

Children over two years of age, if the case is severe, should be put on a liquid diet. If food is retained and vomiting is not troublesome, semisolid food may be given; if this causes no disturbance, easily digested solid food may be allowed. Kumiss is sometimes of value, and custards, barley, oatmeal, or arrow-root gruels, broths, junket, and the like are useful in varying the diet.

If much difficulty is experienced in feeding the child, the food should be given in small quantities every two or three hours. If vomiting persists, the measures recommended in the section on Vomiting may be tried. If a meal is vomited, it may be repeated after a short interval. Children with mucous disease should receive the diet recommended for that condition.

In weak children and in protracted cases alcohol may be needed. This may be given in the form of liquid beef peptonoids, panopepton, milk-punch, egg-nog, or sherry and albumin-water. In many cases it is desirable to give only the stimulants, and in these cases whisky and sweetened water or wine may be given. A good matured whisky is usually the most satisfactory, as the dosage is easier to manage and the effect more constant. In very severe cases nutrient enemata may be necessary.

It has been held by some that diet has a specific influence on the course of this disease. Hannon claims to have cured cases in two weeks by a "tonic diet" that consisted of roast-beef with toast and pure Madeira or port wine in the morning; biscuit and wine at noon; meat broth, roast meat, toast, and wine in the afternoon; wine in the evening, and cold water at night. He allowed no milk, vegetables, soups, or puddings.

INFLUENZA

The diet in this disease should be that recommended in all acute febrile conditions. During the height of the disease the food should be liquid, and be given in small quantities and at regular intervals. As the condition improves a return to a semisolid diet and then to solid food may be made. Convalescence is apt to be slow and tedious, and during this period easily digested nutritious food should be given in as large quantities as the patient can digest. Milk and eggs, either alone or combined in the form of egg or egg-nog, may be given between meals. Alcohol is usually indicated throughout the disease, and may be given in the form of whisky and water, wine, or malted liquors, according to the condition and taste of the patient. If convalescence is slow, a change of air will often facilitate recovery and restore the appetite and strength.

MENINGITIS AND CEREBROSPINAL FEVER

In these diseases the diet is that of all acute fevers. The food may be liquid or semisolid, and should be given at regular intervals. If the patient is able to swallow, several ounces may be given at a time every two or three hours. If swallowing is difficult, small quantities of predigested food may be given at very short intervals—every half-hour, or if it is given only a teaspoonful at a time, as frequently as every fifteen minutes. In these cases the food may be given with a teaspoon or a medicine-dropper. In some cases, where it does not excite convulsions, a stomach or nasal tube may be used.

If the patient is able to swallow, liquids and semisolids are indicated. Water may be given freely, and as the patients are often unconscious or only semiconscious, water should be given as a routine. This is a matter that is frequently neglected.

Alcohol may be used when the pulse and general condition indicate the need for stimulation. During the acute stage it is usually not required, and when given too early may intensify the cerebral symptoms. As the patient's strength fails it is demanded in increasing quantities.

The convalescence is to be managed as after any acute fever, and an abundance of food should be allowed.

DIPHTHERIA

The feeding of diphtheria patients is carried out along the same lines as those laid down for acute fevers in general. Owing to the location of the lesion and the frequency with which intubation or tracheotomy is performed, special difficulties arise, and must be met promptly and intelligently, or the patient may succumb rapidly.

The careful management of the diet in diphtheria is of the greatest importance. If the patient's nutrition is not maintained, the body will not be able to withstand the effects of the poisons that are introduced into the circulation.

If the disease occurs in a nursing infant, Koplik advises that the milk be drawn from the breast with a breast-pump and fed to the child from a bottle or spoon. This is done to avoid infection of the breast. If the mother has been rendered immune, the danger of breast infection is very slight.

When the patient is very ill, liquid or semisolid food should be given, usually in small quantities and at regular intervals. Milk, either plain or modified by the addition of lime-water, carbonated waters, cereal gruels or gelatin, as outlined elsewhere in this volume, is the most useful food. Gelatin jellies flavored with fruit juice or wine, custards, junket, cereals, plain ice-cream, malted milk, and similar preparations may be given. Occasionally semisolids are swallowed more easily than liquids.

If the patient cannot swallow, nutrient enemata may be resorted to; or, as recommended by Gilman Thompson, a nasal or a stomach-tube may be employed. If the latter mode of feeding is adopted, care should be taken to avoid struggling with patients whose hearts are weak.

Intubation.—After intubation has been done there may or may not be some difficulty in swallowing. As a rule, when the child swallows for the first time, there may be a slight cough or some hesitation; in the majority of cases, however, this disappears as the apprehension of the child is allayed. There may be a little difficulty for the first day, but this passes off gradually as the muscles become accustomed to work under the new conditions.

Some children find it difficult to close the epiglottis with the tube in position, and hence during deglutition some of the food is likely to be drawn into the larynx or even into the lungs. This may cause dyspnea and violent coughing, or when drawn into the lung may give rise to pneumonia. This accident is not very likely to occur if perfectly made tubes are used, and if the precaution is taken to press the tube well into place before the mouth-gag is removed.

O'Dwyer believed that food that enters the tube is always coughed up and never causes pneumonia. He recommended that, if the child is old enough, he be instructed to take the food as rapidly as possible and then to cough afterward, instead of after each act of deglutition, as he is apt to do. In some children there may be a slight regurgitation through the nose. Taken all in all, the difficulty experienced in feeding these cases is small compared to the enormous benefit the child derives from the operation.

If there is difficulty in swallowing liquids, solid or semisolid food may be given instead. Castelberry, of Chicago, suggests that the child be placed with his head lower than his body. In this position swallowing becomes easy. The child may also lie across the nurse's lap with his head thrown well back and down. It should always be remembered that food may be refused because of nausea, or because the child has no desire to take anything, as well as owing to any actual difficulty in swallowing.

The diet should be the same as in non-operative cases, and if semisolids or solids are required, soft-boiled or poached eggs, milk-toast, custards, junket, bread and milk, oatmeal porridge, and similar foods may be given.

If swallowing becomes impossible, an event that occurs very rarely, the child may be fed with the stomach or nasal tube or by means of nutrient enemata.

No especial dietetic rules are necessary for feeding tracheotomy cases.

Postdiphtheritic Paralysis.—In paralysis of the muscles of deglutition which may occur after diphtheria, most of the food may return through the nose; or if the muscles of the tongue as well as the soft palate are involved, deglutition becomes impossible. When this occurs, the child must be fed with the stomach or nasal tube or by the rectum. (See Gavage)

ERYSIPELAS

The diet in erysipelas is the same as in other acute fevers. During the height of the disease a liquid diet, given in small quantities and repeated at short and regular intervals, is recommended. As the patient improves a gradual return may be made to the ordinary diet.

Alcohol is useful, and patients with erysipelas, like those with septicemia, may take large quantities without producing an intoxicat-

ing effect. In the severe forms whisky or brandy may be given at regular intervals in doses sufficient to maintain the heart action. The effect of the stimulation should be watched carefully and the amount regulated according to rules previously laid down. From sixteen to twenty-four ounces a day may be required.

RHEUMATISM

Acute Rheumatism.—The exact relation that diet bears to rheumatism has not been proved, and the statement that any special diet may act as a predisposing factor is conjectural. Improper and insufficient food are responsible only in so far as they lower the resistance of the body.

During the acute attack the management of the diet is similar to that of other acute fevers. Some diversity of opinion exists as to what constitutes the best diet in these cases. Cheadle allows animal broths, and says that he has never seen any advantage result from cutting them off entirely. Senator prescribes a somewhat more liberal diet than is given in other acute fevers.

During the acute stage the safest place is to put the patient on a milk or on a milk and farinaceous diet. If the patient can not take milk, oyster or clam broth, preferably without the oysters or clams, raw oysters, milk-toast, barley or arrow-root gruel, buttermilk, kumiss, and, if these are not sufficient, soups and broths, may be given. It is well, so far as possible, to avoid animal broths, and meat-extracts are contraindicated.

Thirst is usually a prominent symptom, and for this bland or acid drinks may be given freely. Lemonade is generally serviceable, especially since lemons have been advocated in the treatment of the disease. Carbonated water or Vichy may be used, and milk and carbonated water, buttermilk, or kumiss may be tried.

Until convalescence is fully established,—that is, for a week or ten days after the fever has subsided,—the patient should be fed only milk and farinaceous food. The return to solid food should be gradual. Fish, oysters, and eggs should be added first, followed by chicken and later by other meats. Vegetables may be added at the same time, the more easily digested, such as well-baked potato and well-cooked spinach, cauliflower tops, stewed celery, and the like, being chosen first. Sweets are to be avoided, but fresh fruit may be taken. The patient's strength should be fostered, and if there is anemia, the return to the more easily digested animal foods should not be delayed too long.

The meals should not be of sufficient size to tax the patient's digestion, and may be supplemented by two or three extra glasses of milk a day, served with a piece of toast or a biscuit, or by an egg-nog or a cup of vegetable broth.

Alcohol is contraindicated in the acute stage of the disease, but

may be prescribed for very weak patients and where cardiac complications indicate its use. During convalescence, if there is continued weakness, it may be employed.

Chronic Rheumatism.—Where the disease is chronic, the diet should be as nourishing as possible. As a rule, sweets and meat are best avoided. Fish, eggs, oysters, and the lighter meats, all farinaceous foods, and the more digestible vegetables, particularly the green ones, may be allowed. When the patient is very weak and anemic, alcohol may be given if desired; in other cases, where the tonic or stimulant effect is not especially indicated, it is to be avoided. Care should be taken not to mistake this condition for gout or for arthritis deformans, as is so frequently done.

ASIATIC CHOLERA

Infection with the cholera spirillum takes place through the mouth, and is usually caused by drinking contaminated water. Infection may also be conveyed by milk and by raw vegetables, by touching a contaminated object, and by similar methods. The disease may be carried by flies, and thus milk and other foods may become infected.

During a cholera epidemic the following prophylactic measures are to be carried out. Only the more important ones will be mentioned here; for a detailed study of this subject the reader is referred to works on Hygiene and on Public Health:

Fatigue, mental worry, and anything that lowers the mental or physical tone should be avoided.

All exhausting exercises should be excluded, and alcohol taken but sparingly, if at all. Disturbances of the stomach or bowels should receive prompt treatment, and active purgation should be avoided.

All food should be cooked and all beverages boiled, with the exception of those bottled and known to be absolutely free from any possible contamination with the cholera spirillum. Coffee and other similar beverages should be made from boiled water. Ice should be made from distilled water, or when this is not practicable should not be used in any article of food or drink. Only boiled water should be used for cleansing the teeth.

All raw vegetables and all food, such as fish or shell-fish, that may be partly decomposed, should be avoided. Care should be taken to secure pure milk.

Any article of food liable to produce indigestion or diarrhea should not be eaten.

Since the micro-organism causing cholera will not thrive in an acid medium, acid drinks are a useful preventive measure against infection. Lemonade made with aromatic sulphuric acid or dilute sulphuric acid has been widely recommended. Ten or fifteen drops of the acid should be added to a glass of water. Phosphoric acid and lime-juice, as well as vinegar and pickles, are also used. Care

should be taken not to disturb the digestion by taking too much acid, and it should be taken through a tube, to protect the teeth.

The disease is usually divided into four stages; this division is, however, arbitrary. These stages are: a premonitory diarrhea, a severe diarrhea, a stage of collapse, and a reactionary stage. The mildest cases pass through only the first and the second stage. The diet for each stage will be indicated further on. In addition to the diet, certain general indications for treatment may be mentioned. Kenneth MacLeod has summarized these somewhat as follows:

The patient should be put to bed and kept absolutely quiet. The preliminary diarrhea should be checked as soon as possible. As the circulation fails stimulants should be given. If the temperature is excessive, it should be reduced; if the bodily heat is lowered, it should be raised.

Any persistent diarrhea should be checked; any tendency to vomiting should be relieved if possible. Thirst should be allayed, and pain and distress alleviated so far as possible.

During the stage of diarrhea little or no food should be given. Acid drinks, and sulphuric acid especially, may be administered. If food is taken, it should be given in very small quantity, and in the form of albumin-water, beef-juice or predigested beef solutions, barley- or oatmeal-water, or whey. Milk is best avoided, for if it is not digested or absorbed, it forms a most excellent culture-medium for the development of the cholera spirillum. If it is given, it should first be peptonized. Tea in small quantities may be allowed if desired, or a little red wine (claret) may be administered.

In the second stage continuous purging and vomiting generally occur. Morphin hypodermically is probably the best means of checking these symptoms. A mustard-plaster over the abdomen may give some relief, or turpentine stupes may be applied. During this stage no food should be given, for it will be rejected. Thirst should be allayed as far as possible by any of the following articles, given in very small quantities and at ten- or fifteen-minute intervals: Cracked ice, cold water, cold acid water (dilute phosphoric or sulphuric acid diluted with water), carbonated water, iced lemonade, or lime-juice. Weak tea or strong black coffee may also afford relief. If vomiting continues, thirst may be assuaged by allowing the patient to hold a little iced lemonade or iced water in the mouth without swallowing it.

If morphin does not check the vomiting, it may sometimes be relieved by washing out the stomach with normal salt solution or with weak boric acid solution. If the fluid in the patient's body is much reduced and the patient passes into the third, or algid, stage, injections of normal salt solution may be given subcutaneously or intravenously. By this means a patient is often revived, but, unfortunately, the permanent relief hoped for by this method of treatment has not been attained.

When the vomiting ceases and the severe symptoms begin to subside, small quantities of food may be given. At first a teaspoonful every fifteen minutes may be tried; and if this is retained, the quantity may be increased and the interval lengthened. Albumin-water, peptionized milk, and beef-juice or predigested beef solutions should be given at first. The stomach often remains irritable for days and weeks after an attack, and great care should be exercised not to excite diarrhea or vomiting. Stimulants, in the form of small doses of iced champagne or diluted brandy or whisky, may be administered.

The convalescence should be conducted as after typhoid fever.

YELLOW FEVER

This disease is usually described as presenting three stages: the period of invasion and fever, followed by a period of calm or remission. Many mild cases recover without passing into the third stage, which is merely an exacerbation of the second stage, and is accompanied by black vomit and frequently by uremia and collapse.

Almost all writers agree as to the necessity of withholding all food for the first seventy-two hours of the disease. At the outset it is well to give an enema and two or three grains of calomel, followed by absolute rest of the stomach so far as the giving of food is concerned. As most of the subjects of yellow fever are in robust health when stricken, the starvation is well borne. If food is given, it is almost certain to be rejected and to aggravate the symptoms. During this period Sternberg recommends the following mixture:

Sodium bicarbonate	50 grains
Mercury bichlorid	$\frac{1}{3}$ grain
Water	40 ounces.

Of this, three tablespoonfuls are to be given ice-cold every hour; a treatment that has been highly praised. Touatre is a firm believer in the efficacy of Vichy (Célestins), and administers one or two bottles a day. Absolute rest and an abundance of fresh air are essential adjuncts to the treatment. If Vichy can not be obtained, soda-water, one dram to a quart of cold water, may be used instead.

If vomiting is severe, the stomach should be given absolute rest and salt solution be administered by the rectum; or if the rectum becomes irritable and the patient should become algid, the injections may be given intravenously, as recommended in cholera.

During the third day, if the temperature falls below 102° F., a small quantity of milk and lime-water may be given every four hours. This is more likely to be retained if taken cold. Gruels, paps, and the like should be avoided, and nothing but milk and lime-water or albumin-water may be allowed. Tea and other beverages may excite vomiting. Anderson, however, suggests one small cup of freshly prepared tea, drawn but a minute or two, to be taken in the morning

to refresh the patient. All solid food should be forbidden until convalescence is well established, as very slight indulgences have resulted fatally.

If the patient gets worse instead of better, and if vomiting begins again and the diarrhea is severe, all food will be rejected. Iced champagne, Rhine wine, or brandy and water may be administered in small quantities at frequent intervals. Black coffee may also be employed. Cracked ice, soda-water, lime-water, Vichy, or the carbonated waters may be given a trial. Thirst may be somewhat relieved by allowing lemonade or dilute acid solutions to be held in the mouth rather than swallowed. Subcutaneous injections of normal salt solution, or in very severe cases intravenous injections, may be tried. Mustard paste may be applied over the epigastrium or turpentine stupes may be ordered. Morphin hypodermically is more efficient in relieving the vomiting than any other drug.

If the severe symptoms abate, nourishment may again be attempted. A teaspoonful of albumin-water, with or without a little dilute brandy or champagne, or the same quantity of peptonized milk or of predigested beef-solution, may be given. If this is retained, it may be repeated in from twenty minutes to half an hour, the quantity being gradually increased and the interval lengthened to two hours. The stomach is apt to be irritable for days, and the food must be liquid and often predigested. Peptonized milk, albumin-water, chicken-broth without fat, and similar fluids may be given. The convalescence is to be conducted as after typhoid fever.

DENGUE

The diet in this disease is that of an acute fever. For the thirst, freshly prepared and iced carbonated water may be given. Alcohol is not usually required, except in habitués, and is best avoided in the early stages. Severe cases should be treated like yellow fever.

MALARIA

During the attack of an intermittent fever the stomach is generally irritable, and if food is given it is likely to be vomited. If the patient has any desire for food, milk, broths, or gruels may be allowed. When the appetite returns, the customary diet may be resumed. The diet should be varied, and fruit and green vegetables administered to counteract the constipation that is usually present. The anemia that follows repeated attacks of malaria often requires an especially nutritious and invigorating diet, such as is prescribed in the convalescence from fevers in general.

In the prolonged and more or less continuous malarial fevers the diet is similar to that of any acute fever. Alcohol may be given in the convalescence following the severer forms. Whisky is a popular adjunct to treatment, and care should be exercised that too much be not taken and injurious habits formed.

BALANTIDIUM COLI INFECTIONS

There have been a number of different dietetic suggestions advised in this disease. The most effective diet seems to be that proposed by Greene and Scully (Jour. Amer. Med. Assoc., July 28, 1923, lxxxi, 291). They use 2½ quarts of whole milk a day, given in small portions; one or two soft eggs are also given. On this diet, supplemented with bismuth subnitrate in 15-grain doses during the first few days, the stools usually become normal in a week. Later, if the bowels are sluggish, stewed fruit is added, and as soon as the organisms disappear from the stools a gradual change is made to a full diet. No colonic irrigations are needed.

SPRUE

This is a disease seen chiefly in the tropics and is due to a monilia infection. The disease is a very variable one and its treatment seems to consist of placing the patient upon a diet more or less free from sugars and starches, inasmuch as the monilia ferments these and so causes a diarrhea. Several methods are used; one is to place the patient upon a strict milk diet. The patient is first given castor oil or some other purge and is then placed upon varying quantities of milk, usually from eight to twelve ounces every two hours. During this milk diet period, which is usually kept up for eight days, the patient should be kept quiet, but not necessarily in bed. The castor oil is usually repeated twice a week. Cultures of the Bulgarian strain of the lactic acid bacillus may be added, particularly where the patients do not tolerate milk well. After the tenth day Ashford recommends the addition to the diet of bananas, the amounts being gradually increased, as is also the amount of milk. After varying lengths of time, generally a month, salads and other fruits and meats are added, taking care to see what effect they have, but sugar is generally withheld for at least six months or longer.

In cases in which the milk is not well borne the patient is put upon a strict meat diet, the meat being chopped and generally served lightly browned and hot. About two pounds may be given in a day at three-hour intervals for six meals. The meat should be preceded by the administration of some ten ounces of water. After the first week salads and fruits may generally be added.

Fruit diets and vegetable diets have been used in still other cases. It would seem that the carbohydrate-free diets of diabetes may be utilized in the treatment of this disease to advantage.

TETANUS

In all cases of this disease the efforts should be directed toward supplying the patient with the largest possible amount of nourishment. Many cases die from exhaustion, due, in part, to lack of food. The difficulties of feeding a lock-jaw patient can be appreciated only by

one who has managed a severe case. Extreme emaciation and marked anemia, the result of insufficient nutriment, are generally present.

When the disease is not severe, liquid nourishment can usually be given without difficulty by allowing the food to pass between the teeth. This is rendered easier when a tooth is missing. If the teeth are so regular and fit so closely together as to keep all food out, nasal or rectal feeding may be tried. In these cases food should be given every one or two hours, and from one to several ounces should be taken at a time. Milk, which should be partially peptonized, milk-punch, egg-nog, albumin-water, panopepton and water or any reliable liquid predigested beef, meat broths, and stimulants should be administered. Milk, if it agrees with the patient and can be given in sufficient quantities, is very useful.

In severe cases any attempt to handle the patient or to feed him is likely to bring on a convulsion. This is as true of rectal feeding as of mouth-feeding. In some cases rectal feeding may be successful. In these difficult cases anesthesia may be induced by chloroform, and if the jaws relax sufficiently, a stomach-tube may be passed and a pint of predigested food and stimulant poured into the stomach. In many cases a nasal tube can be used to good advantage.

RABIES

The management of the diet in rabies is substantially the same as in tetanus. In most cases even the slightest movements about the patient may excite violent spasms. When this is the case, all attempts at feeding, whether by mouth, nasal tube, or rectum, must be discontinued. Osler has suggested that the throat be cocainized so as to lessen the spasms and permit the patient to swallow. Whenever possible, this should be done, but it can not generally be accomplished. If the patient is suffering from hunger, chloroform may be administered by inhalation to the point of relaxation, and food be given by the stomach- or nasal tube or by the rectum. Since all cases of rabies are fatal, the patient's sufferings should not be augmented by ineffectual efforts to administer food. One who has never seen a case of rabies can not realize the extent of the suffering that attempts at feeding may induce.

TUBERCULOSIS

The importance of proper diet in tuberculosis has been dwelt upon since the time of Hippocrates. Aretæus mentions the use of milk in the treatment of phthisical patients. Quotations pregnant with facts relating to the value of proper food might be added from almost every medical writer of prominence. Osler sums up the matter as follows: "As a healing of a tuberculous process is largely dependent upon the state of nutrition, the question of diet becomes of the very first importance."

In a disease with such protean manifestations there are many points

that must be considered. As the malady usually attacks the lungs, this section will deal principally with pulmonary tuberculosis, for if the dietetic management of a case of pulmonary phthisis is understood thoroughly, there will be no difficulty in modifying it to meet the requirements of other forms of the disease.

From the outset the patient must be impressed with the fact that diet is of primary importance in the treatment of the disease, and whenever he displays a tendency to become careless in this regard, the injunctions concerning diet must be repeated. Directions should not be given in a general way, but should be specific, covering both the articles to be eaten and those to be avoided. The time for taking food and the amount to be taken should be carefully outlined. These points vary with different patients, but each case must be studied individually if success is to be attained. It is generally better to give written instructions concerning the diet, as the patient is apt to be forgetful, especially if he has certain strong likes and dislikes.

Care should be taken to give only such directions as the condition of the patient will warrant carrying out. A good diet and fresh air at home are to be preferred to starvation in a more suitable climate. The patient should not be permitted to spend too much of his money on railroad fare and too little on food.

While this is true, one should not lose sight of the fact that to obtain the best results, the patient must have an abundance of fresh air, and carefully regulated hours of rest and exercise, and the whole life must be so ordered as to secure as great freedom from care and worry as is possible.

The necessity of studying individual requirements is very great, and the best results are obtained where the physician directs the diet and life of the patient with professional skill and common sense. In a general way it may be stated that no tuberculosis patient can get along on too little food, and this has led to rather universal overfeeding, and many overeat, and, indeed, with some physicians and some patients, overeating becomes a fixed idea.

The aim should be to cure the patient, and not to make what some one has termed a flabby, breathless, inert mass. A smaller diet, well digested and assimilated, is much better than overfeeding. Hyperalimentation may be used in certain cases under supervision, but it often leads to gastric and intestinal irritability, with vomiting and diarrhea, foul breath, coated tongue, drowsiness, headaches, and in some patients there may be an unfortunate obesity.

The best diet for a tuberculous patient has not been definitely determined, but valuable work has been done along this line, and the subject is much better understood than it was a few years ago. The question resolves itself into what foods are best for the tuberculosis patients, and how much should they be given. In other words, what amounts of protein, carbohydrates, and fats will give the best results. It is manifestly impossible to make a definite dietary for a disease in

which the conditions are necessarily so variable, but some general deductions may be made which may serve as a standing and as a point of departure for individualizing.

As regards the amount of protein food required, there are different opinions. Nitrogen equilibrium may be established and maintained at various levels, from as low as 50 or 60 grams of protein for the average-sized individual up to 120 grams as an average amount, and beyond this to some 150 or 160 grams a day, although these latter amounts may, in some individuals, cause symptoms. The lower figures are, undoubtedly, too low for the consumptive, and perhaps the best results are obtained by the higher figures, as full amounts of nitrogenous food undoubtedly stimulate the body's power of resistance. Too high nitrogen intake causes unnecessary wear and tear on the organs, and the amount should never be so great as to cause the symptoms commonly described by the term "biliousness." Bardswell and Campbell, as the result of careful feeding with weighed diets, have suggested that, as a rule, the protein should be increased about 30 per cent. above what would be indicated for the patient if in health under conditions of repose—*i. e.*, up and about, but not doing muscular labor—and this increase should be maintained until the disease has entirely disappeared. If the patient is under weight, there should be a 30 per cent. increase either in carbohydrates or fats, or partly of each, until the patient has gained a few pounds more than the normal weight before being infected, unless this weight should have happened to be an abnormally high one, as in the obese. When this point is reached, a 15 per cent. decrease may be made, and this diet continued until the patient is cured. In an average-sized individual this brings the total food intake up to about 3500 calories per day. King has suggested that the amount of food taken should be between 30 and 40 calories per kilo of body weight. Large, vigorous individuals, with good digestive powers, may take more, while smaller individuals and those who lead sedentary lives, require less. Women, as a rule, require slightly less food than men of the same size and weight.

McCann puts the optimal quantity of protein for patients who are confined to bed with pulmonary tuberculosis at from 60 to 90 gm. a day when the calorie value of the diet is about 2500 calories. Additional carbohydrate and fat must be added if the patient is exercising.

Diets low in protein are not suitable for consumptives, and insufficient diet, which is very often due to poverty or ignorance of how to buy and prepare food, is a frequent cause of failure in treatment. If the tuberculous patient is unable to secure a sufficient nutritious food, his chances of recovery, or even of maintaining a fair degree of bodily health and efficiency, are very slight. Insufficient consideration is given to the economic side of the diet question in dealing with

poor people. The physician must be able to advise as to the foods which have a high food value, are palatable, and have a low cost.

An effort should be made to have the food taken in as concentrated a form as possible, as individuals with weak stomachs may have digestive troubles started if the bulk is too great. This is not so important in working people, as their diet is ordinarily rather bulky. In fact, sometimes if people accustomed to bulky diets are given the same food value in more concentrated form they complain that it does not satisfy their hunger.

It is exceedingly important to keep in mind the individual requirements, and some patients undoubtedly do better on a diet containing smaller amounts of protein. The excreting powers, the patient's general appearance and condition, and other points to be appreciated only by actual experience, are of great value in regulating the diet of the tuberculous patient. A diminution of the amount of food taken may be necessitated by too rapid gain in weight, or by too much nausea and vomiting, or by other evidences of gastro-intestinal disturbance. A fat indigestion calls for a reduction in the amount of fat taken, and the increase in the dietary in those cases may often be made up by a corresponding increase in the carbohydrates. A reduction in the amount of carbohydrates may be indicated where there is intestinal indigestion.

A meat-free diet is sometimes advised, and it would seem that in early cases, with powerful digestion, it may be substituted for the ordinary diet. Its only advantage, however, is its cheapness. When the appetite and digestion are poor, as concentrated a diet as possible is advised, as the meat-free diet is too bulky and liable to cause gastric and intestinal indigestion, and this, in turn, a lessened absorption. Vegetables are more difficult to render palatable and require more skill in their preparation, a point often overlooked by vegetarian enthusiasts.

The nutrition of the patient is a reliable guide as to the progress of the disease. If he is taking sufficient nutritious food, is digesting it, and is gaining in weight, the prognosis is good. If the reverse is the case, the prognosis is bad. A persistent inability to digest food is always an unfavorable symptom. Care should be taken to avoid disturbing the stomach by the use of nauseating drugs. Patients are too frequently dosed excessively with creosote, cod-liver oil, cough mixtures, and hypophosphites, while milk and eggs are not given often enough or only in insufficient quantities.

Irritability of the stomach should receive early and the most careful consideration. It is usually due to fever, anemia, the swallowing of sputum, or improper food or drugs. If due to fever, care in selecting the diet, as will be described hereafter, should be exercised. When there is marked anemia, fresh air, sunshine, good food, massage, and iron in an easily assimilable form are helpful. In all cases the patient should be instructed not to swallow the sputum, as irritability of the

stomach with vomiting is almost certain to follow sooner or later. He should be questioned closely regarding the food and drugs he is taking. One should be certain that he is not taking a patent medicine in addition to what has been prescribed for him. "Quick cures" are always attractive, and are often indulged in secretly, to the great detriment of the patient. A suspension of all drugs from time to time will do much to relieve the overdosed stomach. In some individuals irritability and nausea may be brought on by the too continuous administration of any one drug.

The appetite, since it is generally poor and capricious, is not a good guide as to the amount of food to be taken. In most cases more food can be digested than the appetite demands. While this is so, the desires of the patient should, nevertheless, be consulted so far as possible, and more good can generally be accomplished by humoring the patient's reasonable demands than by combating them. The character of each patient should be studied, and in this condition particularly tact plays an important rôle. A nurse or a physician with natural tact and sympathy will often manage to get sufficient food into an intractable or capricious patient where skill and want of tact would fail completely.

The food should be ready at the time the meal is served, and the service should be prompt, so that the patient is not tired out waiting between courses, and also, that he does not lose his appetite and patience. The plate should not be piled full of food which the patient is expected to eat, as smaller and repeated helpings have been found to be better. Congenial table companions are a great stimulus to eating, and many patients eat fairly well if seated with others who are cheerful and have good appetites.

Other factors to be considered are the nationality and the usual mode of life of the patient. Many of the diet-lists intended for tuberculous patients are taken from the works of German writers. A German or a German-American might thrive upon these, whereas an Englishman, a Frenchman, or an American would find it difficult to take some of the articles advised.

In the choice and preparation of food the utmost care should be exercised. Detweiler's saying, "My kitchen is my pharmacy," holds in these cases. The food should be prepared simply, and yet should be varied and made as tempting as possible.

The stomach and intestine should be watched, and constipation promptly relieved. Patients who are taking large quantities of food and resting much of the time are apt to be costive. Sugars and starches are rarely well borne. This may be due to the presence of catarrhal conditions of the bowel, but may also be true even when catarrh is not present. Young, growing girls often crave sweets, and when this craving is indulged in to excess, the stomach and digestion become disordered.

While sufficient food should be given, an excess is injurious, and

each patient should be watched carefully. Not more should be given at one time than the patient can digest with ease. Bardswell and Chapman, in their studies on metabolism in tuberculosis, found that some patients who were taking very large quantities of food and were gaining in weight were excreting excessive amounts of urea—over 900 grains daily. These patients generally maintained their normal weight, and the disease appeared to be quiescent. For economic reasons they were obliged to reduce the diet of the patients, and found that, instead of producing disastrous results, a gain in weight and general improvement followed. These patients, of course, were being somewhat overfed.

Rest is important, and the patient should be instructed to rest before and after meals; if he is not receiving the combined rest and diet cure, to be spoken of later, he should lie down at least half an hour before and after meals.

Coughing is sometimes excited by the taking of food. If this is due to laryngeal involvement, it should be managed according to directions given under Diseases of the Larynx. When it is due to the pressure of an overfilled stomach, the meals may be smaller and closer together. Gavage or feeding by means of a soft-rubber tube may be employed in those cases that vomit everything they eat because swallowing brings on a spasmodic cough.

The care of the mouth is of great importance. It is well to rinse the mouth before and after eating. The teeth also should be kept scrupulously clean. Knopf advises the use of the following mixture after meals:

℞ Essence of peppermint ....♏x.
Oil of wintergreen ....♏xv.
Thymol ....gr.xv.
Benzoic acid ....ʒiij.
Tincture of eucalyptus ....℥ij.
Alcohol ....℥xv.

M. Half a teaspoonful in a glass of water to be used as a mouth-wash.

Foods to be Used by Tuberculous Patients.—Milk.—This is one of the most important articles of diet for the tuberculous patient. Unless some special reason exists, milk should always form a part of the diet. It may be taken with the meals or be given between the intervals of feeding. It is of the utmost importance that the milk be sipped slowly, and not swallowed quickly in large quantities. The milk may be taken plain, or may be modified in various ways. Lime-water may be added, with or without the addition of cream; carbonated water may be mixed with it, or the milk may be peptonized. Buttermilk or kumiss may be taken if desired.

Eggs, when they can be taken in sufficient quantities, are also of great value. In certain cases they are not well borne. Very lightly coddled eggs are perhaps best, but soft boiled, poached eggs, or an

omelet may be used for a change. Hard boiled eggs, if finely divided, may be used. Whole raw eggs shaken up in milk or orange juice may be used to advantage. There is some question as to the value of raw white of egg, as it is difficult of digestion and not so completely utilized as if slightly cooked.

Meat.—Meat of all kinds, if properly prepared, may be eaten; but "high" game, highly seasoned dishes, and twice-cooked meats should be avoided. Beef and mutton are the most suitable varieties. Raw meats, especially raw beef, have been highly extolled by French writers. The experimental work of Richet and Héricourt on dogs, tending to show the value of raw meat, has been much criticised. Cornil and Chantemesse recently contributed to this subject by their experiments on dogs. Placed under similar conditions, some of the animals were fed on raw meat and others on cooked, and both series were inoculated with virulent tubercle bacilli. The dogs fed on cooked meat all died in a short time of tuberculosis, while those fed on raw meat lived. Some of the animals, at the time in apparent good health, were killed and showed tuberculous deposits. Others lived in apparent good health, and on being killed a year later showed tuberculous deposits in a condition of healing.

Galbraith has recently shown that the exhibition of raw meat is followed by a marked increase of nitrogen retention, provided the heat value and nitrogen of the diet exceeded the actual requirements of the individual per kilo of body weight. He also found that there was an improvement in the intestinal metabolism, and this improvement lasts some time after the return to the use of cooked meat. In Galbraith's patients there was a rapid increase in the hemoglobin, and the digestive leukocytes was remarkably increased.

Grancher suggests that for tuberculous patients the raw meat be given in the form of a finely divided pulp. This is prepared by scraping the meat with a knife, which will result in a mass of shredded meat-fiber. This is placed in a mortar and pounded and rubbed with a pestle until quite smooth. It is then pressed gently through a sieve to remove any larger particles. This raw meat-pulp is very easily digested and highly nutritious. It may be given in various ways, as spread on sandwiches or given in milk or in warm bouillon. It may be mixed with purées of various kinds or with vegetables, or, in the case of children, with small quantities of preserves. It may be rolled into balls and so easily swallowed, or it may be served with an egg, with anchovies, or with pickled herring.

Meat-juice is also of great value. This may be prepared according to any of the recipes given in the Appendix, or the juice may be expressed from beef by means of a meat-press. Good round steak should be very slightly broiled, cut into small cubes, and the juice pressed out. With a good press about eight ounces of juice can be extracted from a pound of meat. This should be seasoned and heated

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by placing the vessel containing it in warm water. Care should be taken not to heat it too thoroughly, or the albumin will coagulate and the juice be spoiled. Freshly prepared beef-juice is always preferable, but when this can not be obtained, liquid beef peptonoids, predigested beef, or Mosquera Beef Meal may be employed.

J. C. Roux and Josias have used the raw-meat cure in children with good results. No cooked meat was allowed these patients.

For patients who can not or will not take raw beef, very rare steak, roast-beef, or beef soup should be prescribed.

Fish.—Fresh fish, boiled, broiled, or baked, may be allowed. Both oysters and clams from which the hard portion has been removed may be eaten, preferably raw, but they may also be given stewed, roasted, or broiled.

Cereals.—Where these can be digested, they are of value. In the early stages of the disease they serve not only as nutriment, but also aid in regulating the bowels, and are usually easily digested. If there is constipation, they are of especial value. Oatmeal, wheaten grits, cornmeal mush, and rice and milk are the most suitable forms.

Vegetables.—Any of the easily digested vegetables may be allowed. They should be steamed or cooked with as little water as possible, to avoid dissolving out the salts, which, together with much of the nutriment, are thrown away with the water.

Bread.—Wheat or rye bread, or mixtures of both, may be used. Zwieback is of great value. All hot breads, pastry, and cakes should be avoided.

Fruit.—All fresh and perfectly ripe fruit may be allowed in moderation. It should be taken the first thing in the morning or as a dessert. Baked apples and oranges are well borne and useful, and grapes, peaches, pears, and other fruit in season may be allowed.

Fats.—In tuberculosis, when fats and oils can be taken and absorbed, the prognosis is always much better than when these can not be tolerated. While they are of the greatest value in treatment, care should be taken not to disturb the patient's digestion by forcing more fatty foods into the dietary than the stomach will tolerate. Most patients, however, soon acquire a dislike for fats of all kinds. They are best given in the form of cream and butter; the yolks of eggs, crisp fat bacon, and olive oil are also useful. Cod-liver oil is really as much a food as a medicine. Either the plain oil or an emulsion may be used, and the doses should be small to begin with and gradually be increased. A common mistake is to administer the oil in excessive quantities. Only perfectly sweet fresh oil is to be used, as rancid or stale oil may disturb the digestion. Its use should be discontinued from time to time. Children bear oil better than do adults. If there is a tendency to diarrhea, fats and oils must be used with caution.

Alcohol.—There is much diversity of opinion concerning the in-

fluence of alcohol on tuberculosis. Three views have been expressed and each has its supporters:

1. That alcoholism is antagonistic to tuberculosis.

2. That alcoholism exerts no special influence on the individual as regards tuberculosis.

3. That alcoholism definitely predisposes to tuberculosis.

The last view has the largest number of supporters, as alcoholism probably renders the body more susceptible to all infections. Osler has stated his opinion as follows: "It was formerly thought that alcohol was in some way antagonistic to tuberculous disease, but the observations of late years indicate clearly that the reverse is the case, and that chronic drinkers are much more liable to both acute and pulmonary tuberculosis. It is probably altogether a question of altered tissue-soil, the alcohol lowering the vitality and enabling the bacilli more readily to develop and grow."

Concerning the use of alcohol in the treatment of tuberculosis, it may be said that, except in the last stages of the disease, it is best avoided. Nationality and habits, however, must not be disregarded. To those habituated to the use of a glass of wine or beer with their dinner, this may be allowed. The quantity taken must be limited to the smallest reasonable allowance. This will vary with each individual.

Patients who are gaining in weight or who are in good condition are better off without alcohol. Those who are going down-hill, may often take light wine, beer, or well-diluted spirits with advantage. Of the last, well-matured, pure whisky is the best.

Patients with high fever who are in an exhausted condition may be given alcohol freely, following the same rules as were laid down in the general consideration of fevers. In these cases alcohol is given as a food, and is, as a rule, very well borne. In these advanced cases pure whisky well diluted is perhaps the best form of alcoholic stimulant, but the patient's taste may be consulted in this respect.

Other Beverages.—The usual beverages may be given in moderation. In chronic tuberculosis cocoa may be taken night and morning with good effect. Tea or coffee may be allowed in small quantities unless they produce unfavorable symptoms. Milk and milk-punch, buttermilk, lemonade, or orangeade may be used, and malt extracts are often of benefit.

Number of Meals.—Food may be given from three to six times daily. On rising, milk may be taken, or, if desired, a cup of bouillon instead. This may be followed by breakfast, and about the middle of the morning a glass of milk, egg-albumin, beef-juice, or broth may be given with a cracker or a piece of toast.

A midday dinner should be the rule, and during the middle of the afternoon a light lunch of scraped beef, milk, or some similar food may be given.

Supper may be taken at a convenient evening hour, and before

going to bed a glass of milk may be drunk. If desired or if deemed necessary, a small amount of liquid nourishment may be taken during the night if the patient awakens. As a rule, however, it is well to give the stomach a full night's rest. In severe cases, where only small quantities of liquid or semisolid food are taken, the intervals should be shortened to every two or three hours.

Feeding Advanced Cases.—In advanced cases patients may generally be permitted to select their diet. These patients can often eat hearty meals with a relish and apparently digest them without difficulty. As a rule, their diet must be light, liquid, or semisolid. The same principles may be applied here as in feeding fever cases, with the exception that the patient's desires should, as far as possible, be gratified.

Phthisis Cures.—Various diet cures have been advocated for the relief of phthisis, and these are referred to under the head of Diet Cures. The benefit which follows their use is due largely to the fresh air and abundance of food they prescribe.

If the patient is well-to-do and can afford a liberal dietary there is little difficulty in constructing a suitable diet list giving approximately the proper amounts of protein, carbohydrates, and fats with a total number of calories sufficiently large to give the best results. The exact amount of food required is most easily determined by ordering a diet which will contain about 30 per cent. more protein food than would be required by the patient ordinarily if not working and increasing the carbohydrates. This can easily be done by adding 3 or 4 pints of milk or 1 quart of milk and 2 to 4 eggs to just about such a diet of plain food as the majority of well-to-do people consume.

This may be given as follows:

If desired a glass of milk may be given early before breakfast before the patient has got out of bed.

Breakfast.—A glass of milk; this may be flavored with tea or coffee and taken from a coffee cup, if desired. If the patient wishes it an orange or a small amount of some other fruit, an ordinary helping of oatmeal, 2 soft-boiled or poached eggs, 2 slices of toast or bread, and ½ ounce of butter. A small piece of bacon may be taken with the eggs if desired, or an ordinary helping of meat or fish may be substituted. In the middle of the morning, at 10.30 or 11.30, a glass of milk.

Luncheon.—A glass of milk, a helping of fish or a chop or a piece of steak or some meat entree, a slice of bread or toast or a roll, ½ ounce of butter, a potato or a helping of rice or hominy or the equivalent. A green vegetable, as spinach or a lettuce or tomato salad, and a dessert of junket, bread pudding, baked custard, or some similar nutritious dish.

In place of afternoon tea, a glass of milk with a few slices of bread and butter.

Dinner—A glass of milk, a small amount of soup if desired, and if it does not interfere with the appetite, an entree if desired, a good helping of some substantial plain meat, as roast beef, mutton, or lamb, or chicken, guinea-hen or turkey, potatoes, or a farinaceous vegetable and a green vegetable, a salad if desired, dessert, and a small piece of cheese.

At Bedtime.—A glass of milk.

The above works out approximately as follows:

Food.	Protein. Grams.	Fat. Grams.	Carbohydrates. Grams.	Calories.
Milk, 3 pints	57	70	87	
Cream, 1 ounce	1	6		
Butter, 1½ ounces	....	32		
Eggs, 2	12	8		
Meat, 6 ounces	44	22		
Fish, 4 ounces	20	10		
Bread, 6 ounces	16	2	88	
Cereal, 2 ounces	8	4	40	
Potatoes or vegetables, 5 ounces	1	....	30	
Desserts, 4 ounces	9	16	50	
Green vegetables, Fruit, Soups, etc.	1	1	7	
	169	171	302	3480.4

The milk taken at meal time should be drunk at the end of the meal and not at the beginning, so as not to interfere with the appetite.

The dinner may be taken in the middle of the day if desired, and the rather lighter meal taken as supper in the evening.

Diets for the poorer classes of the people should be so arranged as to be more or less like the diet to which they are accustomed, both in composition and price. This means that the dietary is more bulky, contains more carbohydrates and less fat. The additional protein and carbohydrate and fat can be conveniently and cheaply added in a quart of milk, meat, beans, peas, or lentils, and butter. Where price is a very great item skim milk may be used in part or entirely and oleomargarin substituted for the butter. Beans, hominy, corn-meal, lentils, dried peas, and similar articles of diet may be used in large quantities and the cheaper cuts of meat substituted. There is not always any real economy in cheaper cuts of meat, as some of them contain comparatively little nutriment. In cities where there are markets, by purchasing just before the market closes, odds and ends of various cuts may often be bought at very low prices and to greater advantage from the standpoint of food value than cheaper cuts.

The diet in sanitariums and hospitals for consumptives is carried on in the same manner as in private practice. The following is from Bardswell and Campbell, and gives a very good standard in the present state of our knowledge of the subject. Individual variations must be made just as in private practice:

Diet for Consumptives.

(Standard diets in use at the King Edward VII. Sanatorium.)

	Men.		Women.	
7.30 A. M.	*Milk*	½ pint.	*Milk*	½ pint.
	BREAKFAST:		BREAKFAST:	
	Porridge (with milk)	½ pint.	*Porridge* (with milk)	½ pint.
	Egg	1 (4 days a week).	*Egg*	1 (4 days a week).
	Meat (A), etc.	2 oz.	*Meat* (A), etc.	1½ oz.
	Bread	2 oz.	*Bread*	1½ oz.
	Butter	½ oz.	*Butter*	½ oz.
	Tea, coffee, marmalade, etc.	q. s.	Tea, coffee, marmalade, jam, etc.	q. s.
12 noon.	*Milk*	½ pint.	*Milk*	½ pint.
1.15 P. M.	LUNCHEON:		LUNCHEON:	
	Meat (B)	3 oz.	*Meat* (B)	2½ oz.
	Pudding (suet or milk)	5 oz.	*Pudding* (suet or milk)	3 oz.
	Bread	2 oz.	*Bread*	1½ oz.
	Butter	½ oz.	*Butter*	½ oz.
	Milk	½ pint.	*Milk*	½ pint.
	Potatoes and vegetables or salad	q. s.	Potatoes and vegetables or salad	q. s.
	Stewed fruit, jam, etc.	q. s.	Stewed fruit, jam, etc.	q. s.
	Cheese and biscuits	q. s.	Cheese and biscuits	q. s.
4.30 P. M.	TEA (optional):		TEA (optional):	
	Tea, bread, and butter, sandwiches or cake	q. s.	Tea, bread, and butter, sandwiches or cake	q. s.
7.15 P. M.	DINNER:		DINNER:	
	Soup or fish (optional).		Soup or fish (optional).	
	Meat (C)	3 oz.	*Meat* (C)	2½ oz.
	Pudding (milk or suet)	5 oz.	*Pudding* (milk or suet).	3 oz.
	Bread	2 oz.	*Bread*	1½ oz.
	Butter	½ oz.	*Butter*	½ oz.
	Milk	½ pint.	*Milk*	½ pint.
	Potatoes and vegetables	q. s.	Potatoes and vegetables	q. s.
	Stewed fruit, jam, etc.	q. s.	Stewed fruit, jam, etc.	q. s.
	Cheese and biscuits	q. s.	Cheese and biscuits	q. s.
9.30 P. M.	*Milk*	½ pint.	*Milk*	½ pint.

N. B.—The weights given are the minimum quantities which patients are prescribed; second helpings of meat, pudding, and butter are allowed if asked for.

Milk is not given both at 7.30 A. M. and 12 noon, but it is left to the patient's choice at which time it is taken.

Meat (A).—At breakfast, on different days of the week, one of the following is provided:

Bacon, ham, fish, tongue, or sausage.

Meat (B).—At lunch, consists of one of the following:

Roast or boiled beef, hot or cold.

Roast or boiled mutton, hot or cold.

Beefsteak and kidney pudding, stewed steak or Irish stew, or liver and bacon.

Chicken, roast lamb, veal, or pork occasionally.

Meat (C).—At dinner, consists of one of the following:

Hot roast or boiled beef, hot roast or boiled mutton, hot roast lamb.

The compulsory diets, which are printed in italics, and which are prescribed in weighed and measured amount, as shown in the table, give diets of the following nutritive values:

Men.—Protein, 144 gm.; fat, 160 gm.; carbohydrate, 270 gm.; calories, 3186.

Women.—Protein, 126 gm.; fat, 160 gm.; carbohydrate, 220 gm.; calories, 2814.

Gastric Irritability.—Gastric irritability is a troublesome symptom in many cases of tuberculosis. Care in avoiding nauseous drugs and preparations will have much to do in preventing it. The patient must also be enjoined strictly not to swallow the sputum. If the attack is severe, the patient should be placed on a liquid diet, consisting chiefly of milk in some form, diluted or peptonized. Buttermilk and kumiss are valuable in this condition and are often well borne. Fresh meat-juice and broths may be allowed, and the various peptonized dishes mentioned in the Appendix may be given to lend variety to the diet. Scraped meat mixed with milk or prepared in the form of small balls is often of service. The predigested liquid beef preparations are useful, and may be given diluted with water. Panopepton poured over crushed ice is sometimes retained when everything else is rejected.

Alcohol may be used in the later stage of the disease or when the patient is very weak. Old brandy mixed with a small quantity of a cold carbonated water or teaspoonful doses of iced champagne are advised in the very serious cases. Larger doses may be given in the less severe cases.

Food and drink should be given in small quantities at short intervals—one to four ounces every two or three hours, or twice as much at longer intervals. The quantity taken should be measured carefully and recorded, as otherwise the patient may receive an insufficient diet or be given a superabundance. In severe cases washing out the stomach gives more relief than any other procedure. In less severe cases a glass of hot water with or without sodium bicarbonate may be taken on rising, and at least half an hour before eating, or preferably an hour before.

If no food is retained, forced feeding by means of a stomach-tube may be tried. This is known as Débove's method. Large quantities —8 to 16 ounces—may sometimes be retained when given by the tube that, if swallowed, would be rejected at once. If the severe form of irritability persists, rectal feeding may be resorted to.

Fever.—If there is fever, the question of feeding the patient should be carefully considered. If there is much irritability of the stomach, the general rules for feeding fever patients may be followed. If digestion is not disturbed and the appetite is good, the patient may be allowed a light diet, of which milk should form a large part; as a rule, it is best given cold. The usual liquid food may also be allowed.

Soups, white meat of chicken, raw or rare roast-beef, or underdone mutton are indicated. Boiled, broiled, or baked fish and oysters and the more easily digested vegetables are permissible. The patient's surroundings have considerable influence on his appetite, and when possible, he should take his meals while reclining on a porch or in a sun-parlor, amid perfect quiet. The excitement and fatigue of a meal in the dining-room are best avoided.

If solid food does not agree, the patient should be placed on a liquid diet. Generally, however, a tuberculous patient with fever will do remarkably well on a general diet. Milk, lemonade, and similar preparations are useful, recipes for which will be found in the Appendix.

The diet for the more advanced cases has been indicated.

Forced Feeding (Suralimentation).—Débove discovered accidentally that food introduced by means of a stomach-tube was retained when, if taken by the mouth, it would be rejected. He therefore turned his attention to the treatment of tuberculous patients by means of this method, and met with a measurable success. This form of treatment is especially applicable in those cases where there are an irritable stomach and no appetite.

Food is introduced into the stomach by the tube at regular intervals. Milk, peptonized or diluted, ground-meat mixtures, eggs and milk, albumin-water, beef-juice, predigested beef preparations, and similar liquid foods may be utilized for this purpose.

When, during fever, the patient's appetite and will-power are equal to it, feeding may be conducted in the usual way, without the tube. Moderate quantities of easily digested food may be given at frequent intervals. Two or three rather substantial meals form the basis of the diet, while on rising, at bedtime, and during the intervals between meals liquid food is to be ordered. Under this method of treatment certain cases gain very rapidly and recover their usual weight in a short time. As soon as the customary weight of the patient is reached, it is well to diminish the quantity of food given, so as to avoid the effects of overfeeding, which show themselves in a coated tongue, a heavy breath, torpidity, and the train of symptoms popularly known as biliousness. Should these symptoms arise, a saline or small doses of calomel, together with a reduction in the amount of food given, will give prompt relief. Gastric catarrh and fever are contraindications to suralimentation.

DIET IN DISEASES OF THE STOMACH

In a recent communication McCarrison (Faulty Food in Relation to Gastro-intestinal Disorders, Jour. Amer. Med. Assoc., January 7, 1922), from his remarkable observations on the effect of diet on human beings as well as in animals, has pointed out the prevalence of gastro-intestinal disorders among civilized people produced by the use of

faulty food, which he has observed to be comparatively infrequent in those races living under more natural conditions. This investigator was able to produce, by feeding with deficient and ill-balanced food over variable periods of time, loss of appetite, vomiting, diarrhea, dysentery, and, as a result, a frequent infection of the gastro-intestinal tract by pathogenic micro-organisms. Definite pathological lesions were noted, especially in the bowel.

In diseases of the stomach the selection of a proper diet plays a more important rôle than the choice of drugs. No absolute dietetic regulations can be formulated in this class of diseases, but it is important to regulate the food in conformity with the particular disease with which the patient is affected, and also to consider the individual tastes and peculiarities of the patient; even in the regulation of a diet in any special disease of the stomach changes are often rendered necessary; these must be made gradually and according to the patient's power to digest the food.

Food is said to be easily digestible when it produces no gastro-intestinal discomfort, is passed from the stomach into the intestine at a normal rate of speed, and is easily absorbed. Under normal conditions the digestibility of foods is easily ascertained, for the motor and secretory functions of the stomach being normal, the effect of the food upon one or both of these functions can readily be determined; in the various gastric disturbances, however, this problem is more difficult, for here there may be a motor or a secretory disturbance, or both functions may be impaired. In determining the diet for a special gastric disturbance two points must be borne in mind: first, the power to increase the nutrition of the patient, and, secondly, the necessity of giving food in a digestible form, so as to lessen the work of the stomach. Leube has devised a scale of the various articles of food, given in the order of their digestibility. This scale forms the basis of the well-known Leube "ulcer diet."

Leube's Diet Scale.[1]—*Diet I.*—If the digestion is very much reduced, the following articles of food are most easily digestible: bouillon, meat solution, milk, raw or soft-boiled eggs.

Diet II.—Somewhat less digestible than Diet I. are the following articles of food: boiled calves'-brain, boiled thymus, boiled chicken and pigeon. The different forms of meat are enumerated in the order of their digestibility. Gruels, and in the evening milk mushes made with tapioca and white of egg, may also be placed in this list. The majority of patients can digest boiled calves' feet in addition to the various meat foods already enumerated.

Diet III.—If Diet II. is well borne, Diet III. may be given. This consists in adding cooked or raw beef to Diet II. Leube gives the following method of preparing beefsteak and believes that beef cooked in this way is very easily digested: The meat should be kept for

[1] Zeitschr. f. klin. Med., vol. vi., p. 191.

some time, and is then scraped with a dull spoon; in this way a pulp is obtained, consisting only of the delicate parts of the muscle, and not containing any of the tough, hard, and sinewy portion. This pulp

Mean Time of Chymification.

Articles of diet.	In stomach.		In vials.	
	How prepared.	Time.	How prepared.	Time.
		h. m.		h. m.
Rice	Boiled	1:00		
Sago	"	1:45	Boiled	3:15
Tapioca	"	2:00	"	3:20
Barley	"	2:00		
Milk	"	2:00	Boiled	4:15
Milk	Raw	2:15	Raw	4:45
Gelatin	Boiled	2:30	Boiled	4:45
Pig's feet, soused	"	1:00		
Tripe, soused	"	1:00		
Brains, animal	"	1:45	Boiled	4:30
Venison, steak	Broiled	1:35		
Spinal marrow, animal	Boiled	2:40	Boiled	5:25
Turkey, domesticated	Roasted	2:30		
Turkey, domesticated	Boiled	2:25		
Turkey, wild	Roasted	2:18		
Goose, wild	"	2:30		
Pig, suckling	"	2:30		
Liver, beef, fresh	Broiled	2:00	Cut fine	6:30
Lamb, fresh	"	2:30		
Chicken, full-grown	Fricasseed	2:45		
Eggs, fresh	Hard boiled	3:30	Hard boiled	8:00
Eggs, fresh	Soft boiled	3:00	Soft boiled	6:30
Eggs, fresh	Fried	3:30		
Eggs, fresh	Roasted	2:15		
Eggs, fresh	Raw	2:00	Raw	4:15
Eggs, whipped	"	1:30	Whipped	4:00
Custard	Baked	2:45	Baked	6:30
Codfish, cured dry	Boiled	2:00	Boiled	5:00
Trout, salmon, fresh	"	1:30	"	3:30
Trout, salmon, fresh	Fried			
Bass, striped, fresh	Broiled	3:00		
Flounder, fresh	Fried	3:30		
Catfish, fresh	"	3:30		
Salmon, salted	Boiled	4:00	Boiled	7:45
Oysters, fresh	Raw	2:55	Raw, entire	7:30
Oysters, fresh	Roasted	3:15		
Oysters, fresh	Stewed	3.30	Stewed	8:25
Beef, fresh, lean, rare	Roasted	3:00	Roasted	
Beef, fresh, lean, dry	"	3:30	"	7:45
Beefsteak	Broiled	3:00	Masticated	8:15
Beefsteak	"	..	Cut fine	8:00
Beefsteak	Raw	..	"	8:15
Beef, with salt only	Boiled	2:45	......	9:30
Beef, with mustard, etc.	"	3:30		
Beef, fresh, lean	"	..	Masticated	
Beef	"	..	Entire piece.	9:00
Beef	Fried	4:00		
Beef, old, hard, salted	Boiled	4:15		
Pork steak	Broiled	3:15		
Pork, fat and lean	Roasted	5:15		
Pork, recently salted	Boiled	4:30	Masticated	6:30

is roasted in fresh butter. Raw ham is also to be recommended. In addition to meat a small quantity of mashed potatoes may be given, some stale wheat bread, and small amounts of coffee or tea with milk (cautiously).

Mean Time of Chymification (Continued).

Articles of diet.	In stomach.		In vials.	
	How prepared.	Time.	How prepared.	Time.
		h. m.		*h. m.*
Pork, recently salted	Fried . . .	4:15		
Pork, recently salted	Broiled . .	3:15		
Pork, recently salted	Raw . . .	3:00	Raw . . .	8:30
Pork, recently salted	Stewed . .	3:00		
Mutton, fresh	Roasted . .	3:15		
Mutton, fresh	Broiled . .	3:00	Masticated .	6:45
Mutton, fresh	" . .	. .	Unmasticated	8:30
Mutton, fresh	Boiled . .	3:00		
Veal, fresh	Broiled . .	4:00		
Veal, fresh	Fried . . .	4:30		
Fowls, domestic	Boiled . .	4:00	Masticated .	6:30
Fowls, domestic	Roasted . .	4:00		
Ducks, domesticated	" . .	4:00		
Ducks, wild	" . .	4:30		
Suet, beef, fresh	Boiled . .	5:30	Entire piece.	12:00
Suet, mutton	" . .	4:30	Divided . .	10:00
Butter	Melted . .	3:30		
Cream	. . . . . .	. .	Raw . . .	25:30
Cheese, old, strong	Raw . . .	3.30	Masticated .	7:15
Cheese, old, strong	. . . . . .	. .	Entire piece.	18:00
Cheese, new, mild	. . . . . .	. .	Divided . .	8:30
Oil, olive	. . . . . .	. .	Raw . . .	60:00
Soup, beef, vegetables, and bread	Boiled . .	4:00		
Soup, marrow bones	" . .	4:15		
Soup, bean	" . .	3:00		
Soup, barley	" . .	1:30		
Soup, mutton	" . .	3:30		
Green corn and beans	" . .	3:45		
Chicken soup	" . .	3:00		
Oyster soup	" . .	3:30		
Hash, meat and vegetables . .	Warmed . .	2:30		
Sausage, fresh	Broiled . .	3:20		
Heart, animal	Fried . . .	4:00	Entire piece.	13:30
Tendon	Boiled . .	5:30	Masticated .	12:45
Tendon	. . . . . .	. .	Entire piece.	24:00
Cartilage	Boiled . .	4:15	Masticated .	10:00
Cartilage	. . . . . .	. .	Divided . .	12:00
Aponeurosis	Boiled . .	3:00	Boiled . .	6:30
Bone, beef's solid	. . . . . .	. .	Entire piece.	80:00
Bone, hog's solid	. . . . . .	. .	Entire piece.	80:00
Beans, pod	Boiled . . .	2:30		
Bread, white, fresh	Baked . . .	3:30	Masticated .	4:30
Bread, corn	" . .	3:15		
Cake, corn	" . .	3:00		
Cake, sponge	" . .	2:30	Broken . .	6:15
Dumpling, apple	Boiled . .	3:00		
Apples, sour, hard	Raw . . .	2:50	Entire piece.	18:00
Apples, sour, mellow	" . . .	2:00	Masticated .	8:30
Apples, sweet, mellow	" . . .	1:30	" .	6:45
Parsnips	Boiled . .	2:30	Mashed . .	6:45

Mean Time of Chymification (Continued).

Articles of diet.	In stomach.		In vials.	
	How prepared.	Time.	How prepared.	Time.
		h. m.		h. m.
Parsnips	Boiled	. .	Entire piece.	13:15
Parsnips	Raw	. .	Entire piece.	18:00
Carrot, orange	Boiled	3:15	Mashed	6:45
Carrot, orange			Entire piece.	12:30
Carrot, orange			Raw "	17:15
Beets	Boiled	3:45		
Turnips, flat	"	3:30		
Potatoes, Irish	"	3:30	Mashed	8:30
Potatoes, Irish			Entire piece.	14:00
Potatoes, Irish	Roasted	2:30		
Potatoes, Irish	Baked	2:30		
Cabbage, head.	Raw	2:30	Masticated	12:30
Cabbage with vinegar	Raw	2:00	Shaved	10:15
Cabbage	Boiled	4:30	Boiled	20:00
Peach, mellow			Cut small	10:00
Peach, mellow			Mashed	6:00

Diet IV.—This list is so arranged that if the patient can digest the articles of food mentioned under this head for some time, he can then begin with his usually accustomed diet: Roast chicken, roast pigeon, venison, partridge, roast-beef—medium to raw (particularly cold), veal (from the leg), pickerel, boiled shad, macaroni, bouillon with rice. Small quantities of wine may be taken one to two hours before eating; gravies are contraindicated. Young and finely chopped spinach is allowable; other vegetables, such as asparagus, may be tried cautiously, although Leube considers this a rather risky procedure. After this fourth diet the patients are allowed to take a more liberal diet, but the increase should be gradual. They should refrain from eating vegetables, salads, preserves, and fruits for some time; and when they are resumed, a baked apple is the first of these articles to be eaten.

Beaumont's Table.—This shows the mean time of digestion of the different articles of diet—naturally, in the stomach, and artificially, in vials, on a water-bath. The proportion of gastric juice to aliment in artificial digestion was generally calculated at one ounce of the former to one dram of the latter, the bath being kept as close to the natural temperature—100° F.—as practicable, with frequent agitation.

"The foregoing table was computed from all the experiments made upon St. Martin since 1825, taking the average from such as were generally performed under the naturally healthy condition of the stomach and with ordinary exercise."

The mean times of artificial chymification have been taken from such experiments as were generally made with the pure gastric juice, or with such juice as was too slightly vitiated to impair its solvent effect in any essential degree. They exhibit the average, as near as

practicable, for the digestion of one dram of alimentary matter in one ounce of gastric juice, or in about that proportion, taking the length of time the food and gastric juice were heated. Exceptions, however, must be made for the bone, oil, cream, and one or two other articles, which chymify much slower and with more difficulty than the less concentrated aliments. Several experiments where the methods were the same and the results were similar have been omitted.

Penzoldt has devised the following table giving the digestibility of food. He experimented on normal cases, achieving his results by means of the stomach-tube, by determining the progress of digestion and the exact time at which the stomach was entirely empty after eating a certain quantity of a special food. The table[1] shows the period of time it takes a given quantity of food to leave the stomach:

One to two hours:

100–200 gm. pure water.
220 gm. carbonated water.
200 gm. tea, alone.
200 gm. coffee, alone.
200 gm. cocoa, alone.
200 gm. beer.
200 gm. light wines.
100–200 gm. boiled milk.
200 gm. meat broth, alone.
100 gm. eggs, soft.

Two to three hours:

200 gm. coffee with cream.
200 gm. cocoa with milk.
200 gm. Malaga wine.
200 gm. "Ofner" wine.
300–500 gm. water.
300–500 gm. beer.
300–500 gm. boiled milk.
100 gm. eggs, raw and scrambled, hard-boiled or as omelet.
100 gm. beef-sausage, raw.
250 gm. calves' brains, boiled.
250 gm. calves' thymus, boiled.
72 gm. oysters, raw.
200 gm. carp, boiled.
200 gm. pike, boiled.
200 gm. shellfish, boiled.
200 gm. cod, boiled.
150 gm. cauliflower, boiled.
150 gm. cauliflower, as salad.
150 gm. asparagus, boiled.
150 gm. potatoes, boiled in salt water.
150 gm. mashed potatoes.
150 gm. stewed cherries.
150 gm. raw cherries.
70 gm. white bread, old or fresh, dry or with tea.
70 gm. pretzels.
70 gm. zwieback, fresh or stale, dry or with tea.
50 gm. Albert biscuits.

Three to four hours:

230 gm. young chicken, boiled.
230 gm. partridge, boiled.
220–260 gm. pigeon, boiled.
195 gm. pigeon, fried.
250 gm. beef, raw, boiled, lean.
250 gm. calves' feet, boiled.
160 gm. ham, boiled.
160 gm. ham, raw.
100 gm. veal, warm and cold, lean.
100 gm. beefsteak, broiled, cold or warm.
100 gm. beefsteak, raw, scraped.
100 gm. tenderloin.
200 gm. Rhine salmon, boiled.
75 gm. caviare, salted.
200 gm. sardines in vinegar, kippered herring.
150 gm. blackbread.
150 gm. barley bread.
150 gm. wheat bread.
100–150 gm. Albert biscuits.
150 gm. potato, as vegetable.
150 gm. rice, boiled.
150 gm. kohlrabi, boiled.
150 gm. carrots, boiled.
150 gm. spinach, boiled.
150 gm. cucumber salad.
150 gm. radishes, raw.
150 gm. apples.

Four to five hours:

210 gm. pigeon, broiled.
250 gm. fillet of beef, broiled.
250 gm. beefsteak, broiled.
250 gm. beef tongue, smoked.
100 gm. smoked beef in slices.
250 gm. hare, broiled.
240 gm. partridge, broiled.
250 gm. goose, broiled.
280 gm. duck, broiled.
200 gm. herring, salted.
150 gm. lentils, mashed.
200 gm. peas as purée.
150 gm. string-beans.

[1] Deutsch. Arch. f. klin. Med., 1893, p. 578, No. 57.

PENZOLDT'S DIET-LISTS.

Diet I. (about Ten Days).

Food or drink.	Largest quantity to be taken at one time.	Method of preparation.	Special requirements.	How to be eaten.
Meat broth . . .	250 gm.	From beef.	Without fat, or not salted.	Slowly.
Cows' milk . . .	250 gm.	Well boiled or sterilized.	Entire milk (or lime-water ⅓; milk ⅔).	If desired, with a little tea.
Eggs	1 or 2	Very soft, just heated or raw.	Fresh.	If taken raw, should be stirred into the warm, not boiling, meat broth.
Meat solution . (Leube-Rosenthal).	30–40 gm.	. . . .	Should have only a slight meat broth odor.	In teaspoonful doses, stirred in meat broth.
Cakes (Albert biscuits) . . .	6	. . . .	Without sugar.	
Water	⅛ liter.	. . . .	Ordinary water or natural carbonated water with a small percentage of CO_2 (seltzer).	Not too cold.

Diet II. (about Ten Days).

Calves' brain . .	100 gm.	Boiled.	Freed from all membranes.	Best taken in meat broth.
Thymus (calf) .	100 gm.	Boiled.	Freed from all membranes.	Best taken in meat broth.
Pigeon	1	Boiled.	Only if young, without skin, tendons and the like.	Best taken in meat broth.
Chicken	As large as a pigeon.	Boiled.	As above (no fattened chicken).	Best taken in meat broth.
Raw beef	100 gm.	Chopped fine or scraped, with a little salt.	From the tenderloin.	To be eaten with cakes.
Rawbeef-sausage	100 gm.	Without any additions.	Smoked a little.	To be eaten with cakes.
Tapioca	30 gm.	Boiled with milk to make gruel.		

Diet III. (about Eight Days).

Pigeon	1	Broiled with fresh butter.	Only young bird, skin, etc.	Without gravy.
Chicken	1	Broiled with fresh butter.	Only young bird, skin, etc.	Without gravy.
Beefsteak . . .	100 gm.	With fresh butter half-rare (English).	From the tenderloin, well beaten.	Without gravy
Ham	100 gm.	Raw, scraped fine.	Smoked a little, without the bone.	With white bread.
Milk bread, Zwieback, or Frieberger pretzels	50 gm.	Crisped, baked.	Stale (so-called rolls, etc.).	To be carefully masticated and well salivated.
Potatoes	50 gm.	(*a*) Mashed, (*b*) boiled in salt water and mashed.	The potatoes should be mealy and crumble on crushing.	
Cauliflower . .	50 gm.	As a vegetable boiled in salt water.	Use only the flowers.	

Penzoldt has also constructed a series of four diet-lists based on the length of time at which various foods leave the stomach, depending upon their mode of preparation and on other qualities of the food.

They agree in the main with Leube's diet-lists, but are more complete and exact.

These tables of Penzoldt are valuable as a basis for the selection of food in gastric disturbances. In these cases it is important that the food be quickly dissolved in the gastric secretion, that it be readily absorbed, that it be neither fermented nor decomposed while being

Diet IV. (about Eight to Fourteen Days).

Food or drink.	Largest quantity to be taken at one time.	Method of preparation.	Special requirements.	How to be eaten.
Venison	100 gm.	Roasted.	From the back, should hang for a time.	
Partridge	1	Roasted without bacon.	Young birds, without, skins, tendons, legs, etc., should hang for a time.	
Roast beef . . .	100 gm.	Medium to rare.	From good, fatted cattle; beaten.	Warm or cold.
Fillet of beef. .	100 gm.	Medium to rare.	From good, fatted cattle; beaten.	Warm or cold.
Veal	. . . . . .	Roasted.	Back or leg.	Warm or cold,
Pike . . . . . / Shad . . . . . / Carp . . . . . / Trout	100 gm.	Boiled in salt water without any abditions.	All fish bones should be carefully removed.	In the fish gravy.
Caviare	50 gm.	Raw.	Slightly salt, Russian caviare.	
Rice	50 gm.	Mashed, pushed through a sieve.		
Asparagus . . .	50 gm.	Boiled.	Soft, without any of the hard parts.	With a little melted butter.
Scrambled eggs	2	With a little fresh butter and salt.		
Omelet (souffle)	2	With about 20 gm. of sugar.	Must have risen well.	To be eaten at once.
Fruit sauce . . .	50 gm.	From fresh boiled fruit to be strained through a sieve.	Free from all kernels and peel.	
Red wine	100 gm.	Light, pure Bordeaux.	Or some corresponding kind of red wine.	Slightly warm.

digested or absorbed, and that the entire process be attended with no discomfort. It must be borne in mind that the digestibility of food varies widely with the individual taste, for no matter how digestible a food may be, if it is unpalatable, it will not be digested properly. In general it may be said: First—that in acute conditions the food should be of such a character that the stomach should be spared as much work as possible; second—in chronic disturbances it is important to supply sufficient quantities of nourishment in an easily digestible form, so as to maintain the body-weight so far as possible. In determining the quantity of food that is necessary during twenty-four hours the amount is estimated in calories of heat. As is well

known, a human being at rest requires 35 calories per kilo of weight, whereas while he is performing light work he requires 40 calories. In order, therefore, to determine the exact amount of nourishment it

COMPOSITION OF THE MOST COMMON FOOD SUBSTANCES.

I. Dairy Products.

	Protein.	Fat.	Carbohydrates.	Calories.
	Per cent.	*Per cent.*	*Per cent.*	*Per 100.*
Cows' milk	4.00–4.30	3.00–3.80	3.70	64.00
Cream	3.61	26.75	3.52	276.01
Butter	0.50	90.00	0.50	837.00
Whey	0.50	0.30	3.60	
Buttermilk	3.00	1.30	3.00	3.67
Kumiss (of cows' milk)	3.35	2.07	0.70 lactic acid 1.90 alcohol 0.80 carbonic acid	32.99
Cheese (cream)	25.00	30.00	3.00	394.00
Cheese	33.00	9.00	5.00	240.00
Egg	12.50	12.00	0.50	165.00
		II. Meat and Game.		
Beef (fat)	17.19	26.38	. . .	315.81
Beef (lean)	20.78	1.50	. . .	99.15
Veal (fat)	18.88	7.41	0.07	146.61
Veal (lean)	19.84	0.82	. . .	86.97
Mutton (very fat)	14.80	36.39	0.05	399.31
Mutton (leaner)	17.11	5.77	. . .	120.81
Pork (fat)	14.54	37.34	. . .	406.88
Pork (lean)	20.25	6.81	. . .	146.36
Ham (Westphalian)	23.97	36.48	1.50	453.69
Sweet bread	22.00	0.40	. . .	93.92
Pulverized meat	64.50	5.24	2.28	322.53
Poultry	22.00	1.00	. . .	100.00
Spring chicken	18.49	9.34	1.20	167.59
Duck (wild)	22.65	3.11	2.33	131.36
Squab	22.14	1.00	0.76	100.07
Game	23.00	1.00	. . .	103.60
Hare	23.34	1.13	0.19	107.08
Venison	19.77	1.92	1.42	105.44
		III. Fish.		
Pike	18.50	0.50	0.75	83.57
Carp	20.61	1.09	. . .	94.64
Shellfish	17.09	9.34	. . .	156.93
Salmon	15.01	6.42	2.85	132.93
Sardellen	22.30	2.21	0.45	113.83
Oysters	4.95	0.37	. . .	24.00
Salt herring	19.50	17.00	0.50	
Caviare	28.04	16.26	7.82	
		IV. Cereals and Vegetables.		
Sago	0.50	Trace	86.50	356.70
Wheat flour	8.50	1.25	73.00	345.78
Rye flour	10.00	2.00	69.00	342.50
Wheaten bread	6.00	0.75	52.00	245.00

is only necessary to know the weight of the individual. Inasmuch as the proteins can be replaced in a measure by the carbohydrates and fats, an interchange of any of these three food elements can be made according to the patient's condition. The following tables, taken

Cereals and Vegetables (Continued).

	Protein.	Fat.	Carbohydrates.	Calories.
	Per cent.	*Per cent.*	*Per cent.*	*Per 100.*
Rye bread	4.50	1.00	46.00	216.00
Roll	6.82	0.77	43.72	213.87
Zwieback	9.50	1.00	75.00	356.00
Cauliflower	2.00–5.00	0.40	4.00	35.00
Carrots	1.04	0.21	6.74	33.85
Asparagus	2.00	0.30	2.50	21.00
Rice	5.50	1.50	76.00	348.10
Beans	19.50	2.00	52.00	311.75
Peas	19.50	2.00	54.00	319.95
Potatoes	1.50	...	20.00	88.00
Oatmeal	12.50	5.26	66.77	338.80
Barley meal	8.31	0.81	75.19	323.00
Spinach	3.49	0.58	4.44	38.00
Pickles	1.02	0.09	0.95	

V. Soups and Beverages.

	Protein.	Fat.	Carbohydrates.	Calories.
Milk soup, with wheat flour	5.00	3.25	15.00	112.00
Meat broth (ordinary)	0.40	0.60		
Meat-juice (pressed)	6.00–7.00	0.50		
Beef-tea	0.50	0.50		
Leube's meat solution	9.00–11.00 protein +1.79–6.50 peptone			
Malt extract	8.00–10.00	...	55.00	258.30
Barley soup	1.50	1.00	11.00	60.96
Rice pap, with milk	8.80	3.50	28.60	182.61
Coffee	3.12	5.18		
Tea	12.38			
Beer	0.50	5.25	0.30	
Porter	0.70	6.00	0.30	6.00

VI. Fruits.

	Free acid.	Protein.	Fat.	Carbohydrates.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Apples	0.82	0.36	...	7.22
Pears	0.20	0.36	...	3.54
Plums	1.50	0.40	...	4.68
Peaches	0.92	0.65	...	7.17
Grapes	0.79	0.59	...	1.96
Strawberries	0.93	0.54	0.45	1.01
Chestnuts	...	5.48	1.37	38.34
Sugar-cane	...	...	...	3.40
Honey	...	1.20	...	5.28

from König,[1] give the composition of different foods and the number of heat units they produce. When the weight of the person is known, it is an easy matter to determine whether the amount of nourishment given is sufficient to maintain the body-weight.

It is well too to weigh every patient suffering with a stomach disorder when treatment is first inaugurated, and to repeat this from time to time in order to determine whether the patient is gaining or losing flesh.

The diet must be considered from the standpoint of the gastric secretion; there may exist, on the one hand, the condition of hyperchlorhydria and hypersecretion; on the other, hypochlorhydria and anacidity.

In cases of hyperchlorhydria an abundant protein diet is indicated, inasmuch as the excess of hydrochloric acid is neutralized by this class of foods. On the other hand, as Riegel points out, certain cases of hyperchlorhydria at times do better upon milk, bread, and amylaceous foods than on protein foods. Ordinarily the proteins that are best adapted for patients suffering from hyperchlorhydria are the red meats and eggs, whereas the carbohydrates must be given in the most easily digestible form.

In cases of hypochlorhydria there is a diminution of the gastric secretion; consequently the protein foods are digested with difficulty, whereas the carbohydrates are more easily digested. In this condition, therefore, only very tender meats, preferably scraped, are to be given, whereas such easily digestible vegetables as spinach, asparagus, mashed potatoes, and farinaceous foods may be eaten in quite large quantities. In hyperchlorhydria and hypochlorhydria a reasonable amount of fat must be eaten, preferably in the form of good butter.

The diet in motor disturbances of the stomach, as in atony or in dilatation, depends greatly upon whether an excess or a deficiency of gastric juice is secreted; if there is an increase, an excess in protein food gives the best results; if, on the other hand, there is a diminution of this secretion, protein food must be given the patient in the most easily digestible form—*e. g.*, as the albumoses and peptones. The carbohydrates and the lighter vegetables may be given in somewhat larger proportion. In both conditions the ingestion of fluids should be restricted as far as possible.

Normally the appetite is a fair indication of the number of calories of heat that may be required; in conditions of gastric disorder, however, this is not the case; these patients lose their appetite, and consequently often take insufficient nutrition. In those instances in which the gastric disorder is somewhat protracted and accompanied by great loss of weight, and in which the patient takes insufficient nourishment, it need only be borne in mind that such a patient, resting quietly in bed, requires fewer calories than necessary for a patient

[1] Die menschlichen Nährungs-und Genussmittel, Berlin, 1883, p. 53.

who is not resting. This plan may, therefore, be used with advantage in the treatment of many patients suffering from stomach disorders.

Liquid Foods in Gastric Disorders.—In those cases in which it is necessary to spare the stomach as much work as possible milk is the food that is usually most easily borne. In order to supply a sufficient number of calories it must be taken in large quantities, frequently diluted with lime-water or barley-water in order to add to its digestibility. In those cases in which milk is not well borne buttermilk, whey, kumiss, and kefir may serve as substitutes. Among the other

I. A Principally Milk Diet with Additions of Carbohydrates in Liquid Form.

	Protein.	Fat.	Carbo-hydrates.	Calories.
	Per cent.	*Per ct.*	*Per cent.*	
Milk, 1700 c.c.	70.2	66.3	69.7	1295
Soup of tapioca flour 30 gm. and 10 gm. albumose [1]	10.0	. .	30.0	164
Soup of 40 gm. wheat flour, with some of the milk, 10 gm. sugar, and 1 egg	7.0	5.5	40.0	244
Total	87.2	71.8	139.7	1703

II. Principally Milk Diet with the Addition of Carbohydrates and Fat in Pap Form and Soups.

	Protein.	Fat.	Carbo-hydrates.	Calories.
	Per cent.	*Per ct.*	*Per cent.*	
Milk, 1500 c.c.	62	58.5	63	1056
Soup of 15 gm. sago, 10 gm. butter, 1 egg, 10 gm. albumose	17	13.5	15	257
Pap of 80 gm. corn flour, 1 egg, 10 gm. sugar (two meals)	7	5.5	90	398
Total	86	77.5	168	1711

III. Milk Diet with Addition of Light Pastry and Broths.

	Protein.	Fat.	Carbo-hydrates.	Calories.
	Per cent.	*Per ct.*	*Per cent.*	
Milk, 1250 c.c.	51	49	52	878
Meat broth with 1 egg; 10 gm. of butter; 50 gm. of fine toasted wheat bread	10	14	30	294
Cakes, 70 gm.; butter, 15 gm. . . .	5	12	50	337
Soup of 30 gm. tapioca flour, 1 egg, 10 gm. butter	7	. .	30	282
Total	73	89	162	1791

[1] 10 gm. albumose are contained in 90 c.c. of Denayer's peptone preparation, in 22 gm. of Kemmerich's, or in 30 gm. of Koch's.

forms of fluids that may be given are broths, (chicken, beef, mutton), bouillon, beef-tea, and meat-juice. Of these, meat-juice is most nutritious. Coffee should be forbidden in patients suffering with gastric disturbance or when allowed at least taken very weak. Weak tea may be taken and may serve as a vehicle for milk. Cocoa has a far higher nutritive value than coffee or tea and is to be recommended.

The following diet-lists, devised by von Noorden,[1] *indicate how an easily digestible diet, containing a sufficient number of calories of heat to maintain the body-weight can be prepared* (shown on pages 451 and 452).

IV. Milk with Tender Meat, Flour, Butter, and Soups.

	Protein.	Fat.	Carbo-hydrates.	Calories.
	Per cent.	*Per cent.*	*Per cent.*	
Spring chicken, 100 gm.	19.6	2.8	. .	106.4
Mashed potatoes, 100 gm.	2.0	4.0	20	127.4
Two eggs	14.1	11.0	. .	160.1
Toasted wheat bread, 100 gm.	7.0	0.5	55	258.8
Butter, 30 gm.	. .	23.0	. .	213.9
Trout, 100 gm.	19.3	2.1	. .	106.4
Milk, 1250 c.c.	51.0	49.0	52	878.0
Total	113.0	92.4	127	1851.0

V. Rich, Not Irritating Diet.

	Protein.	Fat.	Carbo-hydrates.	Calories.
	Per cent.	*Per cent.*	*Per cent.*	
Tender meat,[2] 250 gm.	49	7.0	. .	266
Cocoa, 20 gm.	4	6.0	8	105
Three eggs	21	16.0	. .	235
100 gm. zwieback	8	1.0	75	259
100 gm. wheat bread	7	0.5	55	. .
50 gm. cakes	4	2.3	36	187
50 gm. butter	. .	44.0	. .	407
40 gm. tapioca flour	. .	. .	40	164
40 gm. corn flour	. .	. .	40	164
20 gm. sugar	. .	. .	20	82
1250 c.c. milk	51	49.0	52	878
Total	144	125.8	326	2747

Gelatinous Forms of Food.—Gelatinous articles of food, as gelatin, calves' feet, etc., are easily digested and readily absorbed.

Meats.—The digestibility of meat can be increased by chopping, beating, grinding, scraping, etc.

Eggs.—The digestibility of eggs depends upon their mode of preparation; raw and soft-boiled eggs are usually the most easily digestible forms.

[1] Berliner Klinik.

[2] Meat of various kinds, finely chopped, raw or fried in butter; cold or warm, taken at meals.

Fish.—In regard to fish, those containing but little fat are to be recommended for patients suffering from gastric disturbances, such as shellfish, pike, trout, carp, and halibut.

Carbohydrates.—The number of vegetables from which selection may be made is large. The secretions from the mouth and intestines play an important rôle in the digestion of these substances. They should be masticated thoroughly. In those cases in which there is danger of fermentation they should be given with caution. The best form in which to give amylaceous food is in the form of zwieback, toast, stale wheat bread, tapioca flour, oatmeal, etc. Ebstein has highly recommended aleuronat flour, which contains about 80 per cent. of protein.

Leguminous foods contain a considerable amount of protein, much of which, however, is not absorbed. They are apt to give rise to considerable fermentation. Potatoes are best given mashed or baked. Cabbage contains much cellulose, and should be omitted from the diet of all patients suffering from stomach disorders.

Fruits are of slight nutritive value, but give a relish to other foods and increase intestinal peristalsis.

Fat is to be recommended because of its tendency to increase the weight of the patient, and also because of its high calorie value. Some observers claim, however, that it acts as an irritant to the stomach. It is true that many patients find that fat meat, greasy gravies, etc., give rise to indigestion and often to nausea and vomiting. Much depends, however, on the mode of preparation. A considerable amount of fat may be given in the form of fresh butter spread on wheat bread or toast. Certain forms of chocolate contain quite a large percentage of fat, and on this account are very nutritious. Of these, Mehring's Vigor Chocolate is to be especially recommended. Olive oil is of great value in the treatment of certain gastric disorders (see p. 156).

It must be borne in mind that the supplying of the body with adequate quantities of protein fats and carbohydrates, etc., is not sufficient to maintain growth and life. There are, in addition, other substances which are essential, known as vitamins or accessory food substances, attention to which has already been thoroughly directed. It has been shown by McCarrison that definite pathological changes can be produced in the gastro-intestinal tract by feeding with natural food from which one or more of the vitamins have been extracted. The conclusion, therefore, arrived at by this investigation is that the health of the gastro-intestinal tract is dependent on an adequate provision of vitamins.

Concerning the relative digestibility and nutritive value of various liquid and solid foods, the reader is referred to the section dealing with this subject.

Special Factors bearing on the Diet in Patients Suffering from Gastric Disturbances.—1. Von Noorden [1] demonstrated the fact that the intestine will vicariously perform the work of the stomach in conditions in which the secretory function of the latter is lost. Thus, as has been shown by Ewald, Leube, and others, in cases of atrophy of the gastric mucous membrance in which there is no longer any gastric secretion the patient may maintain his weight, for the intestine assumes the digestive function normally carried on by the stomach. Einhorn [2] has likewise demonstrated this fact in cases of achylia gastrica. The point to be borne in mind is that even in cases in which the secretory action of the stomach is lost entirely, the intestine may assume this function of the stomach.

2. In those cases in which it is necessary to spare the stomach, as when food can not be digested or is vomited, either predigested foods may be utilized or foods may be administered through channels other than the stomach. Among the artificial food preparations are the albumoses and peptones, Denayer's Albumose-peptone, Somatose, Nutrose, and Mosquera Beef Meal. For the various methods of feeding, the reader is referred to the sections on Rectal Feeding, Subcutaneous Feeding, etc.

3. The following rules for eating should be carried out:

(*a*) Food should be thoroughly masticated; this is especially important in those cases in which there are marked gastric disturbances. Biernacki [3] and the authors [4] have shown the importance of the effect of the salivary digestion upon the gastric secretion in so far that an absence of salivary secretion not only results in an absence of amylolysis, but that the proteolysis is much retarded.

(*b*) The meals should be taken at regular intervals and in moderate quantities, according to the nature of the gastric disease; this rule must be varied under certain conditions; *e. g.*, small frequent meals should be taken in atony, whereas under other conditions, such as hyperchlorhydria, somewhat larger meals should be given but three times daily.

(*c*) The temperature of the food is also an important factor in the treatment of gastric disturbances; as Uffelmann has pointed out, the food should be taken at a temperature between 98° and 100° F. The ingestion of very hot food is believed to be a frequent cause of ulcer of the stomach. On the other hand, Wegele attributes the dyspepsia of many Americans to the taking of ice-cold water and other drinks.

(*d*) The question of rest or exercise after eating is one that is of considerable importance to those suffering from gastric disturbances. It is generally admitted that violent exercise should not be indulged in after eating. According to Schule,[5] patients suffering from super-

[1] Berliner Klinik, pt. lv.
[2] Medical Record, 1892.
[3] Zeitschr. f. klin. Med., vol. xxi.
[4] International Medical Magazine, August, 1896.
[5] Berlin. klin. Wochenschr., 1895, No. 50.

acidity should not sleep after eating. From experiments the authors have determined:

(1) Under normal conditions the secretory as well as the motor functions of the stomach are not interfered with during rest; during sleep after a meal, however, the secretory function remains normal, but the motor function is slightly disturbed.

(2) In cases of hyperchlorhydria with normal motor function the acidity is reduced and the motor function remains normal while resting, whereas during sleep the acidity remains about the same and the motor function is impaired.

(3) In conditions of hyperchlorhydria with motor insufficiency the acidity is lessened and the motor function impaired during rest, whereas during sleep the acidity is still further decreased and the motor function still further impaired.

(4) In conditions of hypochlorhydria with normal motor activity the acidity seems to be increased and the motor function remains normal during rest, whereas during sleep the acidity is increased and the motor function is disturbed.

(5) In conditions of hypochlorhydria with diminished motor activity the acidity seems to be increased and the motor function improved during rest, whereas during sleep the acidity remains about the same and the motor function is interfered with.

From these observations it appears that in conditions of gastric disturbances accompanied by hyperchlorhydria and hypochlorhydria and in motor disturbances of the stomach the gastric digestion is improved during rest, but impaired by sleep, after meals.

(6) *Tobacco.*—Inasmuch as tobacco is frequently the cause of certain gastric disturbances such as chronic gastritis its use should be interdicted if possible in patients affected with digestive disorders. It often produces hyperacidity and in habitual smokers in whom it is impossible to entirely abandon smoking, the number of cigars consumed should be materially reduced, or cigars from which the nicotin has been extracted used.

SPECIAL CURES IN THE TREATMENT OF THE DISEASES OF THE STOMACH

Among the special forms of treatment recommended in gastric disturbances may be mentioned the rest cure, the milk cure, the grape cure, and forced feeding or gavage.

The **rest cure,** first devised by Weir Mitchell and subsequently especially developed by Burkhart, in Germany, for the treatment of gastric conditions, plays an important rôle in the treatment of stomach disorders. This treatment is especially useful in cases of neurasthenia with severe anorexia and emaciation. It is also useful in the treatment of ulcer, gastritis, atony, and gastroptosis.

The rest treatment in gastric disorders should be carried out for from six to eight weeks. The results that follow this plan of treat-

ment are often marvellous. The patient should be confined to bed a large part of this time and given a varied diet, food being supplied every two to three hours. Boas advises that instead of the large quantities of milk usually prescribed, the patient will do better if given ½ to 1 liter of cream daily in portions of 150 to 200 c.c. In addition to the protein food he advises a diet rich in carbohydrates and fats. In case of constipation, milk-sugar, honey, marmalade, buttermilk, sour milk, kefir, or yoghurt may be added to the dietary to advantage.

Boas' diet list is as follows:

7 A. M.:	¼ liter vigor chocolate in cream. 3 to 4 zwieback (2 rolls), 20 to 30 gm. butter.
10.30 A. M.:	Cold or warm meat, eggs, egg foods, wheat bread (perhaps Graham bread), 20 gm. butter. 150 gm. cream. Preserves or stewed fruit.
11 A. M.:	¼ liter of soup. Potatoes or other vegetables in purée form. Meat and fish. Salad. Stewed fruit (sweet) or raw fruit. Cider, grape juice, or lemon albumin.
4.30 P. M.:	Coffee or tea with cream (150 gm.), zwieback, crackers, Graham bread, butter (20 gm.), or honey.
8 P. M.:	Eggs or egg foods. Wheat bread, Graham bread, butter (30 gm.). Stewed fruit. Two glasses of fruit wine or one bottle of malt beer.
9.30 P. M.:	200 gm. cream with two to three crackers or zwieback with butter.

For a further consideration of the method and plan of conducting the rest treatment systematically the reader is referred to the section dealing with this subject.

The Milk Cure.—The underlying principle of the milk cure consists in the ingestion of large quantities of milk, either alone or together with other foods. Under normal conditions, when taken alone in large quantities—say three liters a day—milk does not suffice as a food; in certain digestive disturbances, however, milk given alone for a time forms a useful food and allows the stomach to regain its normal tone and functions. Milk is especially useful in the treatment of ulcer of the stomach and in certain forms of chronic gastritis; it is particularly useful in the secondary forms of gastritis, as those depending upon tuberculosis, anemia, etc. In some cases of nervous dyspepsia milk cures sometimes effect remarkable results, whereas in others milk disagrees and, as a consequence, the milk cure can not be undertaken. When there is a diminution or an absence of acid in the stomach, milk is usually not well borne. It is also contraindicated in severe cases of atony and of dilatation, in intestinal conditions accompanied by extreme flatulence and chronic diarrheas.

When milk is given in large quantities in addition to other foods, it is more frequently better borne and is less apt to disagree. One

of the disadvantages of the milk cure is the obstinate constipation the milk is apt to induce. Milk can often be rendered more digestible by the addition of barley-water, lime-water, milk of magnesia, and the like, or small quantities of coffee, tea, or whisky may be added to it. When milk disagrees, cream, buttermilk, kefir, kumiss, or matzoon may be given as a substitute for it. (See Milk Cure.)

Forced Feeding or Gavage.—This method was first introduced by Débove, and consists in introducing milk, eggs, and meat-extracts into the stomach by means of the stomach-tube. It is especially useful in nervous anorexia, in which cases there is great danger of starvation from lack of nourishment.

Duodenal Feeding.—Of the greatest importance in the treatment of certain forms of gastric disorders is the method known as duodenal alimentation (see same). The method of feeding enables us to maintain nutrition when food cannot be taken in sufficient amounts in the normal way. It is especially useful in the treatment of gastric and duodenal ulcer of a severe type associated with intense vomiting, nausea and recurrent hemorrhage, and especially those forms which have resisted the usual method of treatment. It is of great value in the treatment of cases of atony associated with a maximum degree of prolapse of the stomach and intestines in which, on account of the anorexia, the patient is unable to consume an adequate amount of food. It is useful in relieving the vomiting which may be due to a variety of causes, *i. e.*, nervous vomiting.

The Grape Cure.—In this form of treatment the patient lives exclusively upon grapes; it is especially useful in plethoric individuals, in whom it is important to diminish the weight; in chlorotic girls suffering with dyspepsia, and in certain cases of nervous dyspepsia.

The Fast Cure.—Spivak (Colorado Medicine, Dec. 1916) has advocated prolonged fasting as a therapeutic measure in diseases of the gastro-intestinal tract, thus representing the employment of rest in the treatment of diseases of other portions of the body. The total fasting may be continued without harm for many days, usually with much benefit. Except in the more severe cases, the rest in bed may be dispensed with and the patient be allowed to be up. This method is according to this author of especial value in the treatment of gastritis, hyperacidity, anacidity, ulcer of the stomach and of the small or large bowel. "The process of fasting is not combined with pain or distress. At the end of the second day or the beginning of the third day, the desire for food may be entirely absent. Eventually a normal and healthy appetite comes and then the stomach and intestines are found in a condition to do their work efficiently."

DIET IN DYSPHAGIA

Dysphagia may be due to any obstruction in the mouth, pharynx, or esophagus. The difficulty and pain induced by swallowing must

be obviated by lessening the efforts at deglutition as much as possible; for this reason food must be given in a concentrated form, and only in a liquid or semisolid state; milk, egg-albumin, and the concentrated liquid beef preparations are especially useful in this condition. In those cases in which food can not be swallowed in sufficient quantities the patient must be fed through the stomach-tube. In this way broths, gruel, milk, and the like can be passed into the stomach. In very aggravated cases gastrotomy must be performed to prevent starvation.

DIET IN ACUTE GASTRITIS

Oser has said that "every case of acute catarrh of the stomach has a natural tendency to heal of its own accord unless a chronic form is produced by a mistaken diet or wrong medication." It is a generally admitted fact that in the treatment of this condition the diet plays the leading rôle. The first step in the treatment consists in securing absolute rest for the stomach and a total abstinence from food for at least twenty-four hours. This procedure is sometimes very difficult to carry out, for many patients believe that food is necessary for them, and that they can secure relief more quickly by taking nourishment. The nausea and vomiting which are present in more or less degree in this condition, and which are aggravated by the taking of food, will soon convince the patient of the necessity of abstaining from food. The thirst is, however, so severe in these cases that patients may be allowed to rinse the mouth with water frequently, to retain tiny bits of ice in the mouth, or even to drink very small quantities of carbonated waters. With this plan of treatment recovery generally follows in two or three days. After the first twenty-four hours feeding may be begun by giving cautiously small quantities of milk diluted with lime-water, broths, and egg-albumin; these can gradually be increased in quantity, and during the next day or two boiled chicken, sweetbreads, scraped beef, in addition to toast, may be added.

The authors are accustomed to prescribe the following diet about the second or third day after an attack of acute gastritis: [1]

		Calories.
7 A. M.:	150 gm. milk with lime-water	101
9 A. M.:	100 gm. egg-albumin flavored with orange- or lemon-juice	53
11 A. M.:	150 gm. broth with egg	84
1 P. M.:	150 gm. milk with lime-water	101
3 P. M.:	5 gm. Armour's soluble beef in water	10
5 P. M.:	100 gm. egg-albumin flavored with orange- or lemon-juice	53
7 P. M.:	150 gm. milk with lime-water	101
		503

[1] In comparing these diet-lists slight discrepancies in the calorie values of the foods will be noted. These differences have arisen from some authors using the calorie values of raw foods, while others have computed the values of cooked foods. In the diet-lists given by the authors calorie values of foods as prepared for the table are given.

After the third day the diet is increased as follows:

		Calories.
7 A. M.:	150 gm. milk (101) with 70 gm. toast (182)	283
9 A. M.:	2 very soft-boiled eggs	160
11 A. M.:	200 gm. bouillon with 1 egg	85
1 P. M.:	100 gm. rice cooked in milk	177
	70 gm. toast	182
3 P. M.:	100 gm. egg-albumin (53) with 50 gm. crackers (187)	240
5 P. M.:	150 gm. milk with 70 gm. toast	283
7 P. M.:	100 gm. egg-albumin flavored with orange- or lemon-juice	53
		1463

The following table, taken from Boas' Magenkrankheiten, gives a diet-list to be followed after the second or third day following an attack of acute gastritis:

Diet for Acute Gastritis.

		Calories.
8 A. M.:	200 gm. milk with tea	135.0
	50 gm. zwieback	178.9
10 A. M.:	200 gm. bouillon with egg	86.0
12 M.:	200 gm. milk soup	227.2
	50 gm. toasted bread	129.4
3 P. M.:	130 gm. milk	101.2
	50 gm. cakes	187.0
7 P. M.:	200 gm. milk soup with rice	255.4
	50 gm. zwieback	178.9
		1459.0

DIET IN CHRONIC GASTRITIS

The dietetic treatment of chronic gastritis is of far greater importance than the treatment of this disease by the use of drugs. The diet must be varied according to the stage of the disease. Inasmuch as the motor function of the stomach is usually unimpaired and only the secretory function affected, the most easily borne forms of food are liquids, such as broths; unfortunately, these foods do not furnish sufficient nutriment to sustain the patient. Their nutritive value may be increased by the addition of beef-extracts, eggs, barley and rice, peptones, somatose, etc. The diet should vary according to the character of the gastritis; in those cases in which the gastric secretion has entirely or almost entirely disappeared, protein food is digested with great difficulty; it must, therefore, be given in the most digestible form; of these foods, scraped beef, stewed beef, stewed chicken, broiled steak, and boiled sweetbreads are especially to be recommended. Vegetables should also be given in the most digestible form, best as a mush. Milk is useful in most cases; occasionally, however, it is not well borne; when this is the case, it can be made more agreeable by adding small quantities of rice, potatoes, or cocoa to it, or kefir, kumiss, or matzoon may be substituted for it. In those conditions in which considerable acid still remains in the stomach meats in various forms are very acceptable; to this list may be added fish and eggs; vegetables, such as mashed potatoes, spinach, mashed carrots, especially in the form of purées, are to be recommended. In all in-

stances fat should be given in any easily digestible form—as good butter, cocoanut-butter, or Mehring's Vigor Chocolate. It is impossible to formulate exact rules as to the number of meals that should be eaten and the quantity that should be taken at each meal; in a general way, small frequent meals are best borne. Mineral waters are often useful in the treatment of chronic gastritis, and the saline waters and alkaline saline waters are especially to be recommended; of these, the waters of Kissingen, Homburg, Saratoga (Congress), Carlsbad, Marienbad, and Saratoga (Hathorn) are especially noted for their usefulness in the treatment of chronic gastritis. Water should be taken in small quantities between meals. Alcoholic stimulants or any strong stimulants should, as a rule, be omitted; when utilized, they should be given in small quantities and best diluted with mineral waters. Salt and spices may be allowed occasionally in small quantities.

Ewald recommends the following diet in chronic gastritis:

8 A. M.:	150–200 gm. tea with 75–100 gm. of stale bread, toast or zwieback.
10 A. M.:	50 gm. bread, 10 gm. butter, 50 gm. cold meat, or occasionally one glass of light wine or one-third of a liter of milk.
2 P. M.:	150–200 gm. water, milk, or bouillon from white meats; 100–125 gm. meat or fish; 80–100 gm. vegetables; 80 gm. compote.
4 or 5 P. M.:	One-fourth to one-third of a liter of warm milk (occasionally mixed with cocoa or coffee).
7 to 8 P. M.:	200 gm. soup or pap; 50 gm. white bread; 10 gm. butter.
Occasionally at 10 o'clock P. M.:	50 gm. wheat bread (biscuit or zwieback); one cup of tea.

The authors have found the following diet-list useful in cases of chronic gastritis:

		Calories.
8 A. M.:	200 gm. milk flavored with tea	135
	60 gm. stale bread (154) with 40 gm. butter (326)	480
	1 soft-boiled egg	80
10 A. M.:	100 gm. scraped beef (119) with 60 gm. stale bread or toast (154)	273
	(or chicken sandwich (260) or 50 gm. sherry (60) with egg (80))	
11 A. M.:	Bouillon with egg	84
	100 gm. chicken	106
	(or 100 gm. lamb chops (230))	
	or 100 gm. broiled steak (209)	
	100 gm. spinach	166
	100 gm. mashed potatoes	127
	100 gm. stewed apples	53
	60 gm. toast	154
4 P. M.:	120 gm. milk with tea	81
	30 gm. crackers	102
7 P. M.:	60 gm. stale bread (154) with 40 gm. butter (326)	480
	200 gm. milk	135
		2456

Einhorn's diet for chronic gastritis (first week):

		Calories.
8 A. M.:	2 eggs	160
	2 ounces of fresh white bread	156
	½ ounce of butter	107
	1 cupful of tea (100 gm. of tea, 150 gm. milk)	101
	Sugar, 10 gm.	40
10.30 A. M.:	Kumiss, or milk, 250 gm.	168
	Crackers, 30 gm.	107
	Butter, 20 gm.	163
12.30 P. M.:	2 ounces of tender steak or white meat of chicken	72
	Mashed potatoes or rice, 100 gm.	127
	White bread, 2 ounces	153
	Butter, ½ ounce	107
	A cup of cocoa, 200 gm.	100
3.30 P. M.:	The same as at 10.30 A. M.	
6.30 P. M.:	Farina, hominy, or rice boiled in milk, 350 gm.	440
	2 scrambled eggs	160
	Bread, 2 ounces	156
	Butter, ½ ounce	107
	Total	2863

The patient having been kept on this diet for a week or two, it must be changed for one suitable to the milder forms of chronic gastritis. According to Einhorn, the diet should correspond as nearly as possible to the common mode of living. All foods derived from the vegetable kingdom should be given in large portions, while the quantity of meat should be limited. It is best rather to mention only those foods to be forbidden than to point out a few articles that can be taken. Forbid meat with tough fibers, meat that contains too much fat, forbid sausages, lobster, salmon, chicken salad, mayonnaise, cucumbers, pickles, cabbage, strong alcoholic drinks.

Boas' diet for chronic gastritis follows:

		Calories.
8 o'clock:	200 gm. milk and flour soup (100 gm. milk)	121.5
	50 gm. bread	129.4
	30 gm. butter	213.9
10 o'clock:	2 eggs	160.0
	50 gm. white bread + 30 gm. butter	343.3
	or 50 gm. white bread + 30 gm. butter + 60 gm. scraped beef	
12 o'clock:	200 gm. farina milk soup	227.2
	200 gm. milk and rice	353.4
	100 gm. prunes	44.0
3 o'clock:	200 gm. milk and tea or milk and coffee (150 gm. milk)	101.2
	50 gm. white bread	129.4
7 o'clock:	200 gm. rice and milk soup	335.4
	50 gm. zwieback	178.9
		2237.6

Diet for chronic gastritis (Boas):

		Calories.
8 o'clock:	200 gm. milk with 40 gm. cocoa + 30 gm. sugar	462.0
	50 gm. cakes or 50 gm. zwieback (178.9)	187.0
10 o'clock:	50 gm. bread with 30 gm. butter	343.0
	100. gm. calf-brain or 100 gm. sweetbread (90) or 100 gm. broiled rockfish (71.75)	140.0
12 o'clock:	Soup of 30 gm., tapioca, 10 gm. butter and 1 egg	282.0
	10 gm. noodles	352.6
	or 100 gm. spinach (165.65), 100 gm. purée of beans (193), 100 gm. carrots (40), 50 gm. mashed potatoes (63.7)	
	100 gm. breast of young chicken	106.4
	100 gm. veal chops (230), or 100 gm. stewed veal, pigeon, venison, fish, 100 gm. farina, omelet or egg, pancake with ham	288.0
3 o'clock:	100 gm. milk and tea with 28 gm. sugar	147.2
	25 gm. cakes	93.5
7 o'clock:	50 gm. wheat bread with 30 gm. butter	343.0
	50 gm. scraped meat	59.5
		2804.2

DIET IN ATROPHIC CATARRH OF THE STOMACH

In conditions of atrophy of the gastric mucous membrane there is a complete absence of the gastric secretion. The condition has also been termed achylia gastrica by Einhorn. In this disease the intestine acts vicariously and digests the food for the stomach. It is important to arrange the diet so that it can easily be acted upon by the intestinal juices. The food must be broken up into as fine particles as possible, and should to a large extent be given in liquid and semiliquid form. Of the liquids, broths, such as barley, rice, or chicken broth, are to be recommended.

Vegetables are usually well borne; cereals should be eaten after the cellulose has been removed. Peas and beans strained and eaten as a purée, as in broth, are especially useful, as they contain quite a large percentage of protein. Potatoes and rice are to be eaten cooked with broth or milk, or as a mush. Eggs are to be taken soft-boiled. Meats must be given in the most digestible forms, as brains, scraped beef, boiled sweetbreads, and only in small amount; raw oysters and boiled fish are also permissible. In very severe forms somatose and Mosquera Beef Meal are to be added to the milk or broth. Milk is occasionally imperfectly digested in this condition, and cream, kefir, kumiss, or matzoon may be substituted for it. Butter may be eaten on crackers, stale bread, or toast. Such beverages as tea, coffee, cocoa, and small quantities of wine may be allowed.

Small meals should be taken at intervals of two or three hours.

The following diet-list, advised by Wegele, gives the diet in atrophic catarrh:

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	150 gm. cocoa	6.00	4.00	13.50	
Forenoon:	150 gm. wine	...	...	4.00	12.0
	20 gm. butter (on toasted bread)	0.15	16.60	0.12	
	100 gm. maltoleguminose soup	2.60	0.10	6.20	
Noon:	100 gm. scraped beef	20.00	6.00		
	100 gm. mashed potatoes	3.10	0.50	21.30	
	10 gm. malt extract	0.50	...	5.50	
	1 cup tea (with zwieback)				
Afternoon:	20 gm. butter	0.15	16.60	0.12	
	30 gm. honey	0.40	...	22.00	
Evening:	250 gm. rice	22.00	8.25	71.00	
During the day:	75 gm. zwieback (or toasted bread)	9.00	1.50	63.90	
	250 gm. milk	8.70	9.30	12.00	
10 o'clock at night:	10 gm. cognac	...	...	...	7.0
	Total	72.70	62.85	219.64	19.0
	Calories	300	580	920	130
	Entire number of calories				1930

Einhorn[1] advises the following diet in cases of achylia gastrica:

		Grams.	Calories.
8 A. M.:	Oatmeal with cream	150	395
	Cocoa with milk	200	135
	Toasted bread	60	135
	Butter	20	163
12 M.:	Pea soup	200	190
	Scraped meat (broiled) or fish	100	213
	Baked or mashed potatoes	50	63
	Spinach or turnips	50	82
	Wheaten bread	60	135
	Butter	20	163
6 P. M.:	Two eggs (soft-boiled) or scrambled		160
	Farina with milk	200	432
	Wheaten bread	60	135
	Butter	20	163
	Tea (milk and sugar)	240	60
9.30 P. M.:	Kumiss	200	
	Crackers	30	
	Butter	10	
	or a sandwich with cream or caviare		323
			2947

Diet in achylia gastrica (Zweig):

		Calories.
Early morning:	250 c.c. of cocoa in milk, 3 zwieback, 10 gm. butter	466
Forenoon:	Flour soup with 1 egg, 25 gm. toast, 20 gm. butter	371
Noon:	Leguminous soup with 1 egg, 130 gm. scraped beef, 50 gm. vegetable purée, 250 gm. milk, 25 gm. toast, 20 gm. butter	765
Afternoon:	Same as early morning	466
Evening:	2 soft-boiled eggs, 200 gm. rice or farina with milk, 25 gm. toast, 20 gm. butter	822
On retiring:	250 gm. milk	170
	Total	3060

[1] Diseases of Stomach, p. 384.

Elsner advises the following diet in chronic anacid gastritis and in achylia gastrica:

7 A. M.: Soup, milk, or cocoa, wheat bread or toast with butter, and, in case of constipation, marmalade or honey.
9 A. M.: Wheat bread, or toast with butter, cold roast, beer, or white or red wine.
12 M.: Bouillon purée of vegetables, mashed potatoes, boiled fish or boiled meats, white meat of fowl.
3 P. M.: Cocoa or tea, wheat bread or zwieback or light cake.
6 P. M.: Rice or farina, purée of vegetables, wheat bread, butter, cold sliced meats, beer or wine, or mineral water.

Elsner calls attention to the uselessness of eggs in this disorder inasmuch as egg-albumin remains undigested in the intestines, due to the marked antitryptic action of egg white.

DIET IN HYPERSECRETION

By hypersecretion is meant a continuous excessive secretion of gastric juice; the condition may be intermittent or chronic.

In **intermittent hypersecretion** the excessive secretion occurs periodically and is accompanied by extreme distress. This distress may often be lessened if a small quantity of milk or a hard-boiled egg is taken at the very beginning of an attack. Inasmuch as fluids in large quantities tend to increase the vomiting, their use should be prohibited. If thirst is severe, small bits of ice may be given or rectal injections administered. The diet during the interval between attacks is similar to that prescribed in hyperchlorhydria (*q. v.*).

Chronic Hypersecretion.—In this condition an excessive quantity of gastric juice is secreted continuously. In the treatment of this disorder all foods that tend to increase the secretion of acid in the stomach, such as spices, condiments, and stimulants, are to be proscribed. The diet should be made up largely of the proteins, since these foods are generally well borne; the carbohydrates are poorly digested, and hence must be given only in small quantities and in the most readily assimilable forms. Inasmuch as fats diminish the secretion of hydrochloric acid they may be used to advantage in hypersecretion. Fluids should be administered sparingly. Food should be given at intervals of two or three hours. All forms of meats are allowable—chicken, roast beef, lamb chops, broiled steak; "the meats being thoroughly cooked in order to avoid the effect of the extractives which tend to further increase the gastric secretion." Of carbohydrates, the best are oatmeal, zwieback, and Nestlé's food; purée of potatoes, spinach, etc., may also be eaten. Milk is an excellent food in this disease, and may be taken either alone or mixed with tea, coffee, cocoa, or eggs. In aggravated forms of the disorder Riegel advises an exclusive milk diet for about eight days; the milk producing a sedative effect upon the gastric mucous membranes, reducing the secretion of gastric juices. The same effect may be obtained at first by exclusive rectal feeding for a period of six or eight days.

Diet-list for Hypersecretion (after Wegele).

		Protein.	Fat.	Carbohydrates.
Morning:	100 gm. tea with milk	3.4	3.0	4.8
	2 soft-boiled eggs	12.0	10.0	
Forenoon:	150 gm. calf's-foot jelly	35.0	17.0	1.0
Noon:	150 gm. sweetbread in bouillon	32.0		
	250 gm. tapioca mush	12.0	8.0	11.0
	50 gm. cream	2.0	13.5	1.7
Afternoon:	200 gm. milk	6.8	6.0	9.6
Evening:	200 gm. ham	48.0	70.0	
	2 scrambled eggs	12.0	12.0	
At meal times:	100 gm. aleuronat toast	28.3	1.5	66.7
10 P. M.	100 gm. milk }	6.5	6.0	10.0
During night:	100 gm. milk }			
	Total	198.0	147.0	104.8
	Calories	900	1360	430
	Entire number of calories		2700	

The authors have prescribed the following diet in hypersecretion of gastric juice:

		Calories.
8 A. M.:	200 gm. milk flavored with tea	135
	2 soft-boiled eggs	160
	60 gm. toast	154
	40 gm. butter	326
10 A. M.:	50 gm. raw scraped beef	60
	50 gm. toast	130
12 M.:	100 gm. broiled steak	210
	or 100 gm. chicken or lamb chop	
	100 gm. asparagus	18
	or 100 gm. of carrots (41) mashed and strained,	
	or 100 gm. of peas (318) mashed and strained,	
	or 100 gm. spinach (165)	
	100 gm. stale wheat bread	258
4 P. M.:	200 gm. milk	135
	1 soft-boiled egg	80
	60 gm. toast	154
	40 gm. butter	326
7 P. M.:	100 gm. baked trout	106
	100 gm. milk	67
		2319

DIET IN DILATATION OF THE STOMACH

In the dietetic treatment of dilatation of the stomach it must be remembered that the least possible demand should be made upon the motor function of the stomach, and inasmuch as fluids are badly borne must therefore, be given only in very small quantities—not over one to one and one-half liters a day. The fluids that are permissible are milk, cream, cocoa, coffee, tea, and bouillon, all in small quantities. The thirst that accompanies this disease may be relieved by allowing the patient to suck bits of ice or by giving rectal injections of water or normal salt solution, administered by the drop method. Since nutrition is usually very faulty in this disease, nutrient enemata must

frequently be employed. The patient may be given one to two ounces of pure olive oil. The oil not only exerts an antispasmodic action but tends to diminish the gastric secretion. When milk is administered, such substances as tapioca and rice should be added. Egg or concentrated meat-extracts should be added to bouillon to increase its nutritive value. Meats should be given only in the most digestible forms; of these, stewed chicken, boiled sweetbreads, calves'-brains, and scraped beef are to be preferred. Vegetables, such as carrots, spinach, peas, potatoes, should be administered in the form of purées. Bread should be eaten stale; wheat bread or toast is best. Stewed fruits, such as stewed prunes and baked apples, are also permissible. Since fats are apt to cause fermentation, butter should be allowed only in quite small quantities. Alcohol is not to be recommended in this condition; if it must be used, it is best given in the form of some light wine. Strong spices should always be avoided. The use of olive oil in the treatment of dilatation, as has been advocated by Cohnheim, has already been described.

The special feature of the treatment is small quantities of food, given frequently in a semifluid form. It is unwise to prescribe an absolute dry diet, as was formerly advised in the treatment of this condition. Patients with dilatation of the stomach should be cautioned against visiting watering places.

The following is the diet-list used by the authors in dilatation of the stomach:

		Calories
7.30 A. M.:	40 gm. orange juice	88
	100 gm. cocoa (cooked in milk)	180
	50 gm. toast	130
	20 gm. butter	160
10.30 A. M.:	100 gm. scraped beef	118
	50 gm. toast	130
	10 gm. butter	80
12.30 P. M.:	100 gm. lamb chops or chicken or steak	230
	100 gm. peas (purée), spinach, asparagus, or carrots	310
	100 gm. baked potatoes	127
	50 gm. toast	130
	10 gm. butter	80
3.30 P. M.:	100 gm. cocoa in milk	180
7.00 P. M.:	2 soft-boiled eggs	160
	50 gm. toast	130
	10 gm. butter	80
	Total	2313

Boas' Diet-list in Dilatation of the Stomach.

		Calories.
8 A. M.:	100 gm. tea and milk (saccharin, not sugar) with 50 gm. toasted bread	195.50
10 A. M.:	100 gm. flour	437.00
	30 gm. toasted bread (77.70) + 10 gm. butter (71.30)	149.00
12 M.:	150 gm. broiled meat	320.70
	25 gm. mashed potatoes	63.70
	or 50 gm. spinach (82.3), 50 gm. carrots (20.5), or purée of beans (96.5)	

2 P. M.:	50 gm. cream	107.30
4 P. M.:	100 gm. tea with milk (saccharin, not sugar), with 50 gm. toasted bread	195.50
7 P. M.:	100 gm. broiled perch	71.75
	50 gm. wheat bread (129.00) + 10 gm. butter (71.30)	200.30
	100 gm. cream	214.00
9 P. M.:	50 gm. cream	162.30
	Total	2117.05

Wegele's Diet-list for Dilatation of the Stomach.

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	100 gm. scraped ham	25.0	8.0		
	Tea with 50 gm. cream	1.8	13.3	1.8	
Forenoon:	2 eggs	12.0	10.0		
	20 gm. sugar	...	...	16.0	
	20 gm. cognac	...	...	...	13.8
Noon:	100 gm. scraped beef	20.7	1.5		
	100 gm. mashed potatoes	3.8	0.5	21.3	
Afternoon:	Tea with 50 gm. cream	1.8	13.3	1.8	
Evening:	100 gm. roast chicken (hashed)	20.7	1.5		
	100 gm. flour (puff paste)	4.2	4.3	22.0	
During the day:	80 gm. zwieback	8.5	1.2	55.0	
Night:	200 gm. milk	6.4	7.2	9.6	
	Total	104.2	60.8	127.5	13.8
	Calories	427.0	565.0	722.0	100
	Entire number of calories				1600

Biedert's Diet-list for Dilatation of the Stomach.

		Protein.	Fat.	Carbohydrates.
6 A. M.:	500 gm. milk, 40 gm. toast	20.3	18.4	55.8
8 A. M.:	Oatmeal soup with 15 gm. of meat solution	5.5	1.0	14.2
10 A. M.:	Cream mixture (125 c.c. of cream and 6 gm. of lactose), 40 gm. toast	7.8	12.9	41.5
12 M.:	Barley soup with yolk of 1 egg	4.0	9.2	7.7
	140 gm. of roast beef, venison, poultry, boiled chopped beef, or fish	42.8	10.4	
	40 gm. toast	3.3	0.4	30.8
	25 gm. cinnamon cake, soda cake, coffee cake, biscuit, small cup black coffee	2.0	1.5	14.0
4 P. M.:	250 c.c. of milk, water, or cocoa, 3 zwieback (30 gm.)	9.2	11.3	38.3
7 P. M.:	Leguminose soup with 15 gm. of meat solution or soup made from ½ timpe soup lozenge	7.6	1.0	12.6
	Rice flour mush	18.3	14.1	98.1
		120.8	80.2	313.0

Total value, about 2524 calories.

Biedert's Diet-list for Dilatation of the Stomach.

(More Nourishing than the Preceding List)

		Protein.	Fat.	Carbohydrates.
6 A. M.:	250 c.c. milk, 30 gm. toast	11.0	9.3	35.6
8 A. M.:	2 eggs, 20 gm. of toast	13.7	10.2	15.4
10 A. M.:	125 c.c. cream, 2 zwieback	6.9	14.0	18.8

12 M.:	140 gm. roast beef, venison, poultry, chopped beef, or fish	42.8	10.4	
	40 gm. toast	3.3	0.4	30.8
	25 gm. soda cake, cinnamon cake, coffee cake, biscuit	2.0	1.5	14.0
4 P. M.:	250 c.c. milk-cocoa, 3 zwieback with fruit jelly	13.5	15.8	44.6
7 P. M.:	Rice mush, 2 zwieback, cakes	14.8	10.8	78.7
10 P. M.:	250 c.c. milk, 2 zwieback	10.9	10.5	26.3
		118.9	82.9	264.2

Total value, about 2341 calories.

Diet in Dilatation of the Stomach with Anacidity—(After Zweig).

Early morning: lavage of stomach.

		Calories.
8 A. M.:	250 gm. rice, 30 gm. toast or zwieback	278
10 A. M.:	2 eggs, 20 gm. zwieback	235
12 M.:	Leguminous soup of 20 gm. legumes and 1 egg	135
1.30 P. M.:	100 gm. poultry, calves' brains, sweetbreads, or fish, 50 gm. vegetables, 20 gm. toast, 100 gm. milk	336
4 P. M.:	250 gm. cocoa with milk, 3 zwieback	385
6 P. M.:	Tapioca pudding (250 gm. milk, 20 gm. tapioca, 15 gm. sugar)	300
8 P. M.:	50 gm. scraped beef omelet (2 eggs, 10 gm. sugar, 10 gm. butter)	350
9.30 P. M.:	20 gm. toast (150 gm. milk with 30 gm. zwieback)	287
	Total	2302

DIET IN ATONY OF THE STOMACH

Since atony is frequently caused by injudicious and too rapid eating, persons with feeble digestive powers should exercise especial caution to eat slowly, masticate thoroughly, and avoid indigestible food. Persons suffering from atony of the stomach should eat small quantities of food at frequent intervals. Since water is not absorbed in the stomach to any extent, it is advisable that the quantity of fluids taken should not exceed 1½ liters a day; this amount should include all fluids—coffee, tea, soups, etc. If the thirst is very great, enemata of water or nutrient enemata may be administered.

The use of milk in large quantities, as has been recommended, is not generally to be advised when the patient is able to go about, since the weight of large quantities of milk may overdistend the stomach; when, however, a rest cure is instituted, milk is commonly well borne when taken in moderate quantities (250 c.c.) at frequent intervals. The diet in atony of the stomach varies according to the nature of the gastric secretion. In cases of superacidity a liberal meat diet, consisting especially of chicken, beef, mutton, or ham, is to be recommended; fish, eggs, hard and soft boiled, are also permissible; the vegetables should be selected with care; carrots, peas, beans, and cauliflower may be given, but must be mashed and strained so as to rid them of cellulose; potatoes, rice, and grits may also be allowed. Butter is the form of fat best suited to this condition.

Alcoholic stimulants are, as a rule, not well borne, and their use should be prohibited; in a limited number of cases alcohol in the form of a light wine acts as a stomachic, and may be prescribed.

The following list has been used by the authors in the treatment of atony of the stomach:

		Calories.
7 A. M.	40 gm. orange-juice	88
8 A. M.:	200 gm. milk	135
	1 soft-boiled egg	80
	60 gm. toast	154
	40 gm. butter	325
10 A. M.:	100 gm. raw scraped beef	118
	60 gm. stale wheat bread	154
12 M.:	100 gm. broiled steak	209
	or 100 gm. lamb chops (230)	
	or 100 gm. stewed chicken (106)	
	200 gm. asparagus	37
	or 100 gm. peas (318)	
	or 100 gm. spinach (165)	
	100 gm. mashed potatoes	127
	100 gm. apple-sauce	53
	50 gm. bread (stale)	130
3 P. M.:	200 gm. milk	135
	60 gm. wheat bread	154
	40 gm. butter	325
7 P. M.:	100 gm. boiled rock fish	80
	100 gm. milk	67
	60 gm. bread	154
	40 gm. butter	325
		2850

or the following:

		Calories
7.30 A. M.:	60 gm. orange juice	132
	150 gm. milk with tea	100
	100 gm. rice (or other cereal with milk)	127
	50 gm. toast	130
	20 gm. butter	160
10.30 A. M.:	200 gm. milk	135
12.30 P. M.:	100 gm. stewed chicken, chops, or steak	106
	100 gm. peas (mashed or strained)	318
	100 gm. baked potatoes	127
	100 gm. stewed apples	53
	40 gm. toast or stale bread	102
3.30 P. M.:	100 gm. cocoa (cooked in milk)	180
7.00 P. M.:	200 gm. milk	135
	50 gm. toast	130
	30 gm. butter	245
	2 soft-boiled eggs	160
	Total	2340

In those cases in which there is an absence or a diminution of acid in the gastric secretion the lighter forms of meat, such as the white meat of chicken or fish, sweetbreads, stewed chicken, or raw scraped beef, should be allowed; vegetables, on the other hand, must be given

in somewhat larger quantities. The treatment of the chronic constipation accompanying gastric atony, since it is one of the most constant symptoms, requires special mention. In the treatment of this condition the main reliance must be placed on the diet. Such forms of foods should be given as will, in the course of digestion, produce substances that excite intestinal peristalsis; among these foods may be mentioned Graham bread, certain vegetables, such as carrots, beans, tomatoes, peas, and turnips, macaroni, stewed and raw fruits, buttermilk, honey, and cider. This form of diet will often overcome the constipation of atony without the aid of drugs. (For a more extensive consideration of the dietetic treatment of chronic constipation the reader is referred to the section dealing with this subject.)

Diet-list in Atony of Stomach with Hypochlorhydria—(After Wegele).

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	150 gm. leguminose cocoa	6.0	4.0	13.5	
	50 gm. cream	1.8	13.3	1.8	
Forenoon:	1 soft-boiled egg	6.0	5.0		
	20 gm. zwieback	2.5	0.4	15.0	
Noon:	100 gm. scraped beef	17.1	6.0		
	200 gm. mashed potatoes	4.2	2.7	42.6	
	20 gm. malt extract	1.0	...	11.0	
Afternoon:	150 gm. leguminose cocoa	6.0	4.0	13.5	
	50 gm. cream	1.8	13.3	1.8	
Evening:	250 gm. tapioca pulp	12.0	8.0	11.0	
	15 gm. diastase malt extract	0.8	...	9.0	
During the day:	50 gm. zwieback	6.0	1.0	35.0	
10 o'clock at night:	200 gm. milk	6.4	7.2	9.6	
	10 gm. cognac	...	...	...	6.9
	Total	71.6	64.9	163.8	6.9
	Calories	290	600	670	50
	Entire number of calories				1600

Diet-list in Atony of the Stomach with Hyperchlorhydria and Normal Acidity—(After Wegele).

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	150 gm. peptone cocoa	8.0	6.0	7.5	
	50 gm. cream	1.8	13.3	1.8	
Forenoon:	30 gm. milk-toast	3.0	0.2	20.0	
	50 gm. ham	12.5	4.0		
	1 egg	6.0	5.0		
Noon:	120 gm. roast meat	21.0	8.0		
	200 gm. mashed potatoes	4.2	2.7	42.6	
Afternoon:	150 gm. peptone cocoa	8.0	6.0	7.5	
	50 gm. cream	1.8	13.3	1.8	
Evening:	120 gm. cold roast meat	21.0	8.0		
	200 gm. rice	9.0	6.6	28.6	
10 o'clock:	100 gm. wine	...	...	3.3	7.8
During the day:	50 gm. zwieback	6.5	1.6	41.0	
	Total	102.8	74.7	159.1	7.8
	Calories	420	700	640	55
	Entire number of calories				1800

Diet-list for Atony of the Stomach, as advised by Boas.

		Calories.
8 A. M.:	100 gm. milk and tea, 50 gm. wheat bread, 30 gm. butter..... (in constipation, 50 gm. milk).	401.2
10 A. M.:	50 gm. wheat bread, 50 gm. butter	343.7
	60 gm. scraped meat, raw .... or broiled (128.3), or 60 gm. ham (262.2)	71.5
12 M.:	150 gm. cooked beef, and 50 gm. macaroni .... (or 100 gm. rice, farina, mashed potatoes)	439.3
3 P. M.:	100 gm. milk and tea, 50 gm. wheat bread, 30 gm. butter......	401.2
7 P. M.:	100 gm. cold beef	213.8
	50 gm. white bread, 30 gm. butter	343.7
		2214.4

DIET IN ULCER OF THE STOMACH

Prophylactically much can be done by a carefully selected diet to prevent the onset of an ulcer of the stomach. As soon as the very first symptoms become manifest, the patient should be placed upon an absolute milk diet. The temperature of the food should be regulated, so that it be not given too hot or too cold. Anemia, which so frequently accompanies the disease, must be combated; hyperchlorhydria, which is so important an etiologic factor in this condition, must also be overcome. Rosenow's recent work suggests the probability of focal infection with special strains of streptococci as a cause of peptic ulcer in many instances. On this account it is highly important before instituting treatment to remove as far as possible all sources of local infections, such as peridental, tonsillar, appendicular, gall-bladder and infections of any other of the organs of the body. While, however, infection is a probable etiological factor, it has by no means been proved that it is the sole factor in the causation of this disease.

Boas [1] divides the treatment of ulcer of the stomach into several stages:

Stage of Hemorrhage.—In this stage Boas advises absolute rest in bed; the patient not being even allowed to arise for purposes of defecation or urination. No nourishment whatever should be given by the mouth. In robust individuals even nutrient enemata may be omitted. If the patient is weak or in feeble condition, feeding by the rectum may be instituted. (See the section on Nutrient Enemata for the method of preparation and utilization of this mode of feeding.) Only two or three nutrient enemata are to be given daily. Boas carries out this plan for three or four days. After this he gradually begins mouth-feeding, the nourishment consisting exclusively of milk diluted with lime-water, with tea, or with coffee. He begins usually with 300 gm. a day (20 gm. every hour), and, if possible, increases 100 gm. a day, so that on the seventh day the patient consumes 1 liter; on the tenth, 1½ to 2 liters; and on the fifteenth,

[1] Magenkrankheiten, p. 407.

2½ to 3 liters. A third cream may be added to the milk very early in the treatment. In addition he permits beef-tea, freshly expressed or artificial beef-juice, and egg-albumin. The carbonated waters, such as Vichy, are also useful.

After the first week Boas begins the regular Leube and Ziemssen ulcer treatment, which he conducts as follows: The patient is given ¼ liter of Carlsbad water, which he drinks in bed morning and evening. Hot-water applications are placed on the abdomen. The diet during this stage consists mainly of milk in addition to other fluids, as cream, egg-albumin, and even raw eggs. If the patient is very weak, nutrient enemata may occasionally be given.

In the treatment, beginning with the third and continuing during the fourth week, Boas permits the patient to recline on a couch, and continues the use of the Carlsbad water, which should be given for four weeks from the time it is first taken; he advises that the diet still consists mainly of milk, although he now permits the addition of soaked zwieback, scalded crackers, and soft rolls. Meats (sweetbreads, brains, meat balls), fish (perch, oysters in small quantities), in addition to the light red wine and carbonated waters, are also allowed.

After the fourth week, if the patient is doing well, Boas adds from 50 to 200 gm. of mashed potatoes, stewed fruits, and vegetables, such as spinach, carrots, peas, and turnips, in the form of purées, to the diet previously given. The meats—broiled steak, chops, and roast beef—if well cooked, can finally be given more liberally. According to Boas, the patient should avoid raw fruit, acid and highly seasoned foods, and also very hot and very cold drinks, for many years. Even in those cases in which there has been no hemorrhage Boas nevertheless advises the rest treatment. It is generally admitted that the rest cure is the only satisfactory plan for treating cases of ulcer of the stomach. Leube and Penzoldt have devised dietaries for these cases; these have been given elsewhere (see pp. 441, 446). The first dietary should be followed for ten days; the second, for the succeeding ten days; the third, for about eight days. The severity of the condition in each case must, of course, determine the length of time during which each dietary must be continued. In all instances milk seems to be the most useful form of food during the first weeks of this rest treatment. This plan was carried out many years ago by Cruveilhier in his treatment of ulcer of the stomach. Occasionally milk does not agree, and substitutes must be given in its stead. Of these, buttermilk, kefir, matzoon, kumiss, or yoghurt are especially to be recommended. In order to increase the food-value of milk, cream may be added, and the following calculation of Strauss may be utilized in order to estimate this increased value:

	Calories.
A. 100 gm. full milk	70
B. 75 gm. full milk with 25 gm. cream	115

	Calories
C. 50 gm. full milk with 50 gm. cream	185
D. 25 gm. full milk with 75 gm. cream	205
E. 180 gm. cream	250

There are, therefore, of each (milk, milk and cream, and cream) in the half liter:

	Calories.
A.	350
B.	575
C.	925
D.	1025
E.	1250

Among other preparations that have been found useful as foods are the well-known Leube-Rosenthal beef solution, as recommended by Leube and Rosenthal, and chicken and calves'-foot jelly, as advised by Fleiner.

In those cases in which milk is not well borne Débove suggests that the milk be passed into the stomach through the stomach-tube. He found that when given in this way the milk was not vomited. Bouveret also recommends this mode of feeding in intractable cases of ulcer.

There are a number of cases of ulcer of the stomach that do not yield to the ordinary rest treatment as outlined by Boas, Leube, and Penzoldt. Donkin [1] first directed attention to the fact that excellent results could be obtained in this class of cases by exclusive rectal alimentation. His treatment extended over twenty-three days; since then McCall Anderson [2] and Boas [3] have obtained excellent results by this plan of treatment in obstinate and recurrent cases of ulcer of the stomach; Riegel, too, approves of this plan. Boas carries out exclusive rectal alimentation for at least ten days; he then allows fluids, such as milk, tea, bouillon, red wine, for some days, and finally permits the patient to resume his usual diet. We have found, in administering nutrient enemata in this condition, that far better results are obtained when the enemata are given by the continuous-drop method of Murphy at the rate of about 60 drops per hour or less. They are far better retained, and give rise to less irritation to the rectum. Most patients can retain several quarts of milk a day with four to six raw eggs without difficulty, providing the milk and eggs are kept warm so as not to coagulate in the tube. When the patient is greatly reduced in strength, the caloric value of the nutrient enema may be enhanced by the addition of 1 to 2 drams of grape-sugar.

There are a certain number of light forms of ulcer of the stomach in which it is impossible to carry out the rest treatment. In such

[1] Lancet, 1890.
[2] Brit. Med. Jour., 1890.
[3] Magenkrankheiten, p. 59.

cases, at times, Boas advises an ambulatory treatment, together with the use of silver nitrate. The silver is administered in solution on an empty stomach in from 1/6- to 1/2-grain doses; at the same time a carefully regulated diet is given. The food consists chiefly of milk and other fluids; in addition he allows tender meats and fish, mashed potatoes, and vegetables in the form of purées (cautiously), all in moderate quantities.

Cohnheim advises the use of olive oil in the treatment of gastric ulcer, and claims that cases of ulcer associated with or without hyperchlorhydria are quickly cured by means of the oil treatment or by an emulsion of sweet almonds. Bloch has also reported great benefit from small doses of oil. The oil is given before meals, beginning with a few spoonsful and increasing to a wineglassful or more before each meal. If disgust is produced by the oil, its use must be abandoned, or the oil of sweet almonds may be utilized in its stead. With this sweet oil the associated treatment, such as diet, rest, etc., must be carried out.

Mineral waters are often utilized in the treatment of ulcer of the stomach; of these, Carlsbad waters have been especially recommended, but Saratoga (Hathorn) can also be used with benefit. The mineral water treatment should be undertaken only at the spring, after the ulcer has healed, and after the patient has undergone the rest cure. The treatment at Carlsbad or Saratoga will often prevent the possibility of relapses. After the ulcer has healed, it is important to overcome the anemia which is usually present in most cases of gastric ulcer. This may be accomplished by means of the diet (see Diet in Anemia) as well as by sending the patient to some invigorating watering-place or to the mountains. Iron and arsenic should also be given to overcome this condition. They should not, however, be prescribed until the ulcer is healed.

DIET-LISTS OF WEGELE FOR ULCER OF THE STOMACH

Diet I—To be followed at least ten days.

		Protein.	Fat.	Carbo-hydrates.
Morning:	250 gm. milk	8.50	9.00	12.0
	2 cakes (5 gm. each)	1.10	0.50	7.3
10 o'clock:	250 gm. milk	8.50	9.00	12.0
	1 cake	0.60	0.25	3.7
12 o'clock:	150 gm. bouillon	0.75	0.45	0.9
	50 gm. meat solution (or egg)	8.50	3.00	3.5
4 o'clock:	250 gm. milk	8.50	9.00	12.0
	2 cakes	1.10	0.50	7.3
	150 gm. bouillon	0.75	0.45	0.9
	50 gm. meat solution or 1 egg	8.50	3.00	3.5
	2 cakes	1.10	0.50	7.3
	Total	47.90	35.65	70.4
	Calories	200	330	330

Diet II—To be followed at least seven days.

		Protein.	Fat.	Carbo-hydrates.
Morning:	250 gm. milk	8.5	9.00	12.0
	3 cakes	1.8	0.75	11.1
10 o'clock:	200 gm. bouillon	3.2	4.40	3.2
	1 egg	6.0	5.00	
Noon:	1 boiled pigeon	22.0	1.00	0.7
	about 200 gm. rice in bouillon	5.0	2.00	40.0
4 o'clock:	250 gm. milk	8.5	9.00	12.0
	2 cakes	1.1	0.50	7.3
8 o'clock:	150 gm. bouillon	6.4	6.70	9.0
	100 gm. sweetbreads	28.0	0.40	
	Total	90.5	38.75	95.3
	Calories	370	350	390
	Entire number of calories			1100

Diet III—To be followed at least five days.

		Protein.	Fat.	Carbo-hydrates.
Morning:	2 cups of tea or coffee with 100 gm. of milk	3.4	3.60	4.8
	20 gm. sugar	0.5		18.2
	3 cakes	1.8	0.75	11.1
10 o'clock:	200 gm. bouillon	3.2	4.40	3.2
	1 egg	6.0	5.00	
Noon:	200 gm. soup	3.2	6.00	17.0
	150 gm. beefsteak	31.0	2.20	
	100 gm. mashed potatoes	3.1	0.85	21.3
4 o'clock:	2 cups tea with 100 gm. milk	3.4	3.60	4.8
	20 gm. sugar	0.5		18.2
	3 cakes	1.8	0.75	11.1
Evening:	100 gm. scraped ham	25.0	8.10	
	200 gm. soup	3.2	6.00	17.0
	Total	86.1	41.25	126.7
	Calories	350	380	520
	Entire number of calories			1250

Diet IV—To be followed at least one week

		Protein.	Fat.	Carbo-hydrates.
Morning:	2 cups tea or coffee, 100 gm. milk	3.4	3.6	4.8
	20 gm. sugar	0.5	...	18.2
	milk-toast (50 gm.)	4.5	0.5	29.0
10 o'clock:	200 gm. bouillon	3.2	4.4	3.2
	1 egg	6.0	5.0	
Noon:	200 gm. soup	3.2	6.0	17.0
	150 gm. roast fowl	27.6	14.0	1.7
	100 gm. carrots or spinach	1.0	0.2	8.1
	200 gm. light flour food	9.0	8.4	45.0
4 o'clock:	2 cups of tea with 100 gm. milk	3.4	3.6	4.8
	20 gm. sugar	0.5	...	18.2
	milk-toast	4.5	0.5	29.0
Evening:	100 gm. cold roast meat	38.2	2.8	
	150 gm. tapioca	7.0	5.0	8.0
10 o'clock at night:	250 gm. milk	8.5	9.0	12.0
	Total	120.5	63.0	199.0
	Calories	495	585	815
	Entire number of calories			1900

The following list, taken from Boas' Magenkrankheiten, gives his diet in ulcer of the stomach:

First week.

		Calories.
8 A. M.:	200 gm. milk and flour soups	121.5
10 A. M.:	200 gm. bouillon with 1 egg	86.0
12 o'clock:	200 gm. rice milk soup	235.4
	farina milk soup (227.4), soup of 30 gm. tapioca, 1 egg, 10 gm. butter (282)	509.4
4 P. M.:	200 gm. milk (134), 50 gm. Nestlé's food (149.5)	284.5
7 P. M.:	Soup of 30 gm. tapioca and 10 gm. albumose	164.0
During the day:	1 liter milk (at 2, 6, 9 o'clock, 330 gm.)	607.5
	Total	1498.9

Second week.

The same diet with the addition of 100 gm. zwieback.

	Total	1856.7

Third week.

8 A. M.:	200 gm. milk	135.0
	50 gm. zwieback	178.9
10 A. M.:	50 gm. scraped meat (59.5), 1 egg (80)	139.5
	50 zwieback (178.9), 30 gm. butter (213.9)	393.8
	with 200 gm. milk	135.0
12 o'clock:	Soup of 30 gm. tapioca, 1 egg, 10 gm. butter	282.0
	100 gm. calves' brain, sweetbread, veal chop, chicken, wild pigeon	140.0
3 P. M.:	200 gm. milk and tea with 30 gm. sugar	135.0
	50 gm. zwieback	178.9
7 P. M.:	60 gm. lean ham	262.2
	50 gm. zwieback	178.9
	300 gm. milk	202.5
	Total	2361.0

Einhorn's diet in gastric ulcer:

First three days.

		Calories.
7 A. M.:	Milk, 150 c.c. (5 ounces)	101
8 A. M.:	Milk, 150 c.c. (5 ounces)	101
9 A. M.:	Milk, 150 c.c. (5 ounces)	101
10 A. M.:	Milk and strained barley-water (āā), 150 c.c.	80
11 A. M.:	Milk, 150 c.c.	101
12 noon:	Milk, 150 c.c.	101
1 P. M.:	Bouillon, either alone or with the addition of 1 to 2 teaspoonfuls of a peptone preparation, 150 c.c.	30
2 P. M.:	Milk	101
3 P. M.:	Milk	101
4 P. M.:	Milk	101
5 P. M.:	Milk, with strained barley or oatmeal	80
6, 7, 8, 9 P. M.:	Milk, 150 c.c.	404
		1402

Fourth to the tenth day.

7 A. M.:	Milk, 300 c.c. (10 ounces)	202
9 A. M.:	Milk, 300 c.c.	202
11 A. M.:	Milk, with barley, rice, or oatmeal-water, 300 c.c.	160
1 P. M.:	One cup of bouillon, 200 c.c., and 1 egg beaten up in it	80
3 P. M.:	Milk, 300 c.c.	202
5 P. M.:	Milk, 300 c.c.	202
7 P. M.:	Milk, with barley-water, 300 c.c.	160

9 P. M.:	Milk, 300 c.c.	202
		1410

Eleventh to the fourteenth day.

7 A. M.:	Milk, 300 c.c.	202
9 A. M.:	Milk, 300 c.c.	202
	And two crackers softened (1 ounce)	100
11 A. M.:	Milk, with barley-water, 300 c.c.	160
1 P. M.:	One cup of bouillon, 200 c.c., 1 egg and 2 crackers	180
3 P. M.:	Milk, 300 c.c., and 1 egg	282
5 P. M.:	Milk, 300 c.c.	202
	And 2 crackers	100
7 P. M.:	Milk, with barley-water	160
9 P. M.:	Milk, 300 c.c.	202
		1790

Fourteenth to the seventeenth day.

7 A. M.:	Milk, 300 c.c.	202
9 A. M.:	Milk, 300 c.c.	202
	And 2 crackers	100
11 A. M.:	Milk with barley, 300 c.c.	342
1 P. M.:	Scraped meat, 50 gm.	60
	2 crackers, 1 cup of bouillon, 200 c.c.	100
3 P. M.:	Milk, 300 c.c.	202
5 P. M.:	Milk, 300 c.c.	202
	1 egg (soft boiled)	80
	2 crackers	100
7 P. M.:	Milk, with farina, 300 c.c.	342
9 P. M.:	Milk, 300 c.c.	202
		2134

Seventeenth to the twenty-fourth day.

7 A. M.:	2 eggs (soft boiled)	160
	Butter, 10 gm.	81
	Toasted bread, 50 gm.	130
	Milk, 300 c.c.	202
10 A. M.:	Milk, 300 c.c.	202
	Crackers, 50 gm.	166
	Butter, 20 gm.	162
1 P. M.:	Lamb chops (broiled), 50 c.c.	60
	Mashed potatoes, 50 gm.	44
	Toasted bread, 50 gm.	130
	Butter, 10 gm.; 1 cup of bouillon, 200 c.c.	81
4 P. M.:	The same as 10 A. M.	530
6.30 P. M.:	Milk with farina, 300 c.c.	342
	Crackers, 50 gm.	166
	Butter, 20 gm.	162
9 P. M.:	Milk, 300 c.c.	202
		2820

Lenhartz[1] cautions against the strict abstinence diet in the treatment of ulcer of the stomach, even in those instances in which there is hemorrhage. He bases his conclusions on the fact that since ulcer of the stomach is most frequently accompanied by superacidity and also by an enfeebled condition, it is best to give protein food early to overcome the acidity as well as to build up the system. The accompanying table illustrates his method of feeding:

[1] Deutsch. Med. Wochenschr., 1904, No. 11.

Day after last hematemesis	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Eggs	2	3	4	5	6	7	8	8	8	8	8	8	8	8
Sugar, gm.			20	20	30	30	40	40	50	50	50	50	50	50
Milk, c.c.	200	300	400	500	600	700	800	900	1000	1000	1000	1000	1000	1000
Raw scraped beef, gm.						35	2×35	2×35	2×35	2×35	2×35	2×35	2×35	2×35
Milk cooked with rice, c.c.							100	100	200	200	300	300	300	300
Zwieback, gm.								20	40	40	60	60	80	100
Ham (raw), gm.										50	50	50	50	50
Butter, gm.										20	40	40	40	40
Calories	280	420	637	779	955	1135	1588	1721	2138	2478	2941	2941	3007	3073

The Lenhartz diet as modified by Lambert to suit the American dietary is as follows:

Day.	Eggs.	Milk.	Sugar.	Scraped beef.
I.	2 drams each dose; total, 2 eggs.	4 drams each dose; total, 6 oz.		
II.	3 drams per dose; total, 3 eggs.	6 drams per dose; total, 10 oz.		
III.	½ oz. per dose; total, 4 eggs.	1 oz. per dose; total, 13 oz.	20 grams added to eggs.	
IV.	5 drams per dose; total, 5 eggs.	1½ oz. per dose; total, 1 pt.	20 grams added to eggs.	
V.	6 drams per dose; total, 6 eggs.	14 drams per dose; total, 19 oz.	30 grams.	
VI.	7 drams per dose; total, 7 eggs.	2 oz. per dose; total, 22 oz.	40 grams.	36 grams in 3 doses.
VII.	4 drams per dose; total, 4 eggs; also 1 soft-boiled egg every 4 hours; total, 4 eggs.	2 oz. per dose; total, 25 oz.	40 grams.	70 grams, with boiled rice; 100 grams in 3 doses.
VIII.	4 drams per dose; total, 4 eggs; also 1 soft-boiled egg every 4 hours; total, 4 eggs.	1½ oz. per dose; total, 28 oz.	40 grams.	70 grams, with boiled rice; 100 grams in 8 doses.
IX.	. . . .	3 oz. per dose; total, 1 qt.	. . . .	Beef same; rice, 200 grams; zwieback, 40 grams, in 2 portions.
X.	4 drams per dose; total, 4 eggs; also 1 soft-boiled egg every 4 hours; total, 4 eggs.	Add cooked chopped chicken, 50 grams; also butter, 20 grams.	40 grams.	Beef same; rice, 200 grams; zwieback, 40 grams, in 2 portions.

XI.–XII.—Interval of feeding made two hours; milk given in 6-oz. doses with ½ oz. raw egg; butter increased to 40 grams, and various additions made as detailed above.

In the Lenhartz cure, absolute rest in bed for at least four weeks is maintained. An ice-bag is placed on the abdomen, and left on more or less continually for two weeks. On the first day, even though there be hematemesis, 200 c.c. of iced milk are given in teaspoonful doses together with two raw, ice-cold, beaten up eggs. Bismuth is given at the same time two or three times daily in single doses of 2 grams, and continued for ten days. The eggs are beaten up with sugar, and they are kept cold by placing the cup containing them in a dish filled with ice. The milk is increased every day by 100 grams, and one additional egg added; on the ninth day the patient is given 1 liter of milk, and the quantity is not increased; on the sixth day raw scraped beef is added, and the quantity is doubled on the following day; on the seventh and eighth days the patient is given some well-cooked rice and zwieback (softened), and on the tenth, raw ham and butter.

MODIFIED LENHARTZ ULCER DIET OF SEALE HARRIS

First Day—1 egg, 1½ oz. cream, 4 oz. milk. Mix and give ½ oz. every hour from 7 A. M. to 7 P. M. Total calories approximate 300.

Second Day—2 eggs, 3 oz. cream, 8 oz. milk. Mix and give 1 oz. every hour from 7 A. M. to 7 P. M. Total calories approximate 600.

Third Day—3 eggs, 4½ oz. cream, 12 oz. milk. Mix and give 1½ oz. every hour from 7 A. M. to 7 P. M. Total calories approximate 900.

Fourth Day—4 eggs, 6 oz. cream, 16 oz. milk. Mix and give 2 oz. every hour from 7 A. M. to 7 P. M. Total calories approximate 1,200.

Fifth Day—5 eggs, 7½ oz. cream, 20 oz. milk. Mix and give 2½ oz. every hour from 7 A. M. to 7 P. M. Total calories approximate 1,500.

Sixth Day—6 eggs, 9 oz. cream, 24 oz. milk. Mix and give 3 oz. every hour from 7 A. M., to 7 P. M. Total calories approximate 1,800.

Seventh to Tenth Day—6 eggs, 6 oz. cream, 20 oz. milk. Mix and give 3 oz. at 8, 9, 10, 11, 12 A. M. and 2, 3, 4, 5, 6 P. M., and at 7 A. M. and 7 P. M. give two tablespoonsful strained oatmeal, 2 oz. cream, level teaspoonful sugar and 1 soft boiled egg; at 1 P. M. 1 rounded tablespoonful scraped beef, lightly broiled, 1 heaping tablespoonful of rice and 3 oz. milk. Total calories approximate 2,100.

Eleventh to Fourteenth Day—Breakfast at 7 A. M., and supper, 7 P. M., 2 soft boiled eggs, 1 slice of toast, 1 pat butter, 3 tablespoonsful strained oatmeal or cream of wheat, 3 oz. cream, teaspoonful sugar. Dinner, at 1 P. M., 2 tablespoonsful scraped beef or minced breast of chicken, 2 slices dry toast, 2 heaping tablespoonsful of rice, butter and 2 tablespoonsful ice cream, 1 egg, 1 oz. cream and 3 oz. milk at 9 and 11 A. M. and 3 and 5 P. M. Total calories 2,800.

Fifteenth to Twenty-first Day—Same as from eleventh to fourteenth days except that the amount of cereal, cream and chicken or beef may be increased, baked Irish potato may be substituted for rice, and gelatin or boiled custard for ice cream. One egg, 1 oz. cream and 4 oz. milk should be given at 10 A. M. and 4 P. M. Total calories approximate 3,000.

From the Third to Sixth Week—The diet should be the same as in the third week except that strained orange juice may be given for breakfast and purées of peas, beans and potatoes may be given for dinner. Soft green vegtables mashed through cloth or seive may be added. Total calories approximate 3,500.

Note.—The egg, milk and cream mixture should be kept in a covered dish with ice packed around it. The amount for each feeding should be given slowly and with a spoon, and with the same exactness and regularity as if it were medicine.

The scraped beef should be made into a patty and lightly broiled with a little butter and salt.

The rice and oatmeal should be cooked for several hours.

The dry toast should be in slices about 4 x 4 x ½ inches in size. The crust

should be removed and the patient instructed to chew it until it becomes liquid with the saliva.

LENHARTZ'S DIET, AS MODIFIED BY US FOR AMERICAN PATIENTS

First Day

8 A. M.:	Iced milk, 3 oz.
10 A. M.:	Iced egg, 1.
12 M.:	Milk, 2 oz.
4 P M.:	Egg, 1.
6 P. M.:	Milk, 2 oz.
TOTAL:	Egg, 2.
	Milk, 7 oz.
	Calories, 280.

Second Day

8 A. M :	Milk, 3 oz.
10 A. M :	Egg, 1.
12 M.:	Milk, 4 oz.
2 P. M.:	Egg, 1.
4 P M.:	Milk, 3 oz.
6 P. M.:	Egg, 1.
TOTAL:	Eggs, 3.
	Milk, 10 oz.
	Calories, 420.

Third Day

6 A. M.:	Milk, 3d r.
	Milk sugar, 1 dr.
8 A. M.:	Egg, 1.
10 A. M.:	Milk, 3 oz.
	Milk sugar, 1 dr.
12 M.:	Egg, 1.
2 P. M.:	Milk, 4 oz.
	Milk sugar, 2 dr.
4 P. M.:	Egg, 1.
6 P. M.:	Milk, 3 oz.
	Milk sugar, 1 dr.
8 P. M.:	Egg, 1.
TOTAL:	Eggs, 4.
	Milk, 10 oz.
	Milk sugar, 5 dr.
	Calories, 637.

Fourth Day

6 A. M.:	Milk, 4 oz.
	Milk sugar, 2 dr.
8 A. M.:	Egg, 1.
10 A. M.:	Milk, 4 oz.
	Milk sugar, 2 dr.
12 M.:	Egg, 1.
2 P. M.:	Milk, 5 oz.
	Milk sugar, 2 dr.
4 P. M.:	Egg, 1.
6 P. M.:	Milk, 4 oz.
	Milk sugar, 2 dr.
8 P. M.:	Egg, 1.
TOTAL:	Eggs, 5.
	Milk, 17 oz.
	Milk sugar, 1 oz.
	Calories, 777.

Fifth Day

6 A. M.:	Milk, 5 oz.
	Milk sugar, 2 dr.
8 A. M.:	Eggs, 2.
10 A. M.:	Milk, 5 oz.
	Milk sugar, 2 dr.
12 M.:	Eggs, 2.
2 P. M.:	Milk, 5 oz.
	Milk sugar, 2 dr.
4 P. M.:	Egg, 1.
6 P. M.:	Milk, 5 oz.
	Milk sugar, 2 dr.
8 P. M.:	Egg, 1.
TOTAL:	Eggs, 6.
	Milk, 10 oz.
	Milk sugar, 1 oz.
	Calories, 955.

Sixth Day

6 A. M.:	Milk, 5 oz.
	Milk sugar, 3 dr.
8 A. M.:	Eggs, 2.
10 A. M.:	Milk, 6 oz.
	Milk sugar, 2 dr.
12 M.:	Eggs, 2.
2 P. M.:	Milk, 6 oz.
	Milk sugar, 3 dr.
	Raw beef, 1 oz.
4 P. M.:	Eggs, 2.
6 P. M.:	Milk, 6 oz.
	Milk sugar, 2 dr.
8 P. M.:	Egg, 1.
TOTAL:	Eggs, 7.
	Raw beef, 1 oz.
	Milk, 23 oz.
	Milk sugar, 10 dr.
	Calories, 1135.

Seventh Day

6 A. M.:	Milk, 6 oz.
	Milk sugar, 3 dr.
8 A. M.:	Eggs, 2 raw.
10 A. M.:	Milk, 7 oz.
	Milk sugar, 3 dr.
	Milk rice, 3 oz.
12 M.:	Eggs, 2 (soft boiled).
2 P. M.:	Milk, 6 oz.
	Milk sugar, 4 dr.
	Raw beef, 2 oz.
4 P. M.:	Eggs, 2 (raw).
6 P. M.:	Milk, 7 oz.
	Milk sugar, 3 dr.
8 P. M.:	Eggs, 2 (soft boiled).
TOTAL:	Eggs, 8.
	Milk, 27 oz.
	Milk sugar, 13 dr.
	Milk rice, 3 oz.
	Raw beef, 2 oz.
	Calories, 1585.

Eighth Day

6 A. M.: Milk, 7 oz.
Milk sugar, 3 dr.
8 A. M.: Eggs, 2 (raw).
10 A. M.: Milk, 7 oz.
Milk sugar, 3 dr.
Milk rice, 3 oz.
12 M.: Eggs, 2 (soft boiled).
2 P. M.: Milk, 8 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
Zwieback, 5 dr.
4 P. M.: Eggs, 2 (raw).
6 P. M.: Milk, 8 oz.
Milk sugar, 4 dr.
8 P. M.: Eggs, 2 (soft boiled).
TOTAL: Eggs, 8.
Milk, 30 oz.
Milk sugar, 13 dr.
Milk rice, 3 oz.
Raw beef, 2 oz.
Zwieback, 5 dr.
Calories, 1721.

Ninth Day

6 A. M.: Milk, 6 oz.
Milk sugar, 3 dr.
8 A. M.: Eggs, 2.
10 A. M.: Milk, 6 oz.
Milk sugar, 3 dr.
Milk rice, 4 oz.
12 M.: Eggs, 2.
2 P. M.: Milk, 7 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
Zwieback, 10 dr.
4 P. M.: Eggs, 2.
6 P. M.: Milk, 7 oz.
Milk sugar, 4 dr.
Milk rice, 3 oz.
8 P. M.: Eggs, 2.
10 P. M.: Milk, 7 oz.
TOTAL: Eggs, 8.
Milk, 33 oz.
Milk sugar, 13 dr.
Milk rice, 7 oz.
Raw beef, 2 oz.
Zwieback, 10 dr.
Calories, 2138.

Tenth Day

6 A. M.: Milk, 6 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
8 A. M.: Eggs, 2.
Butter ½ dr.
10 A. M.: Milk, 6 oz.
Milk sugar, 3 dr.
Milk rice, 4 oz.
Butter, 1 dr.
12 M.: Eggs, 2.
Butter, ½ dr.
2 P. M.: Milk, 7 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
Zwieback, 12 dr.
Butter, 1 dr.
4 P. M.: Eggs, 2.
Butter, ½ dr.
6 P. M.: Milk, 7 oz.
Milk sugar, 4 dr.
Milk rice, 3 oz.
Butter, 1 dr.
8 P. M.: Eggs, 2.
Butter, ½ dr.
10 P. M.: Milk, 7 oz.
TOTAL: Eggs, 8.
Milk, 33 oz.
Milk sugar, 13 dr.
Milk rice, 7 oz.
Raw beef, 4 oz.
Zwieback, 12 dr.
Butter, 5 dr.
Calories, 2478.

Eleventh Day

6 A. M.: Milk, 6 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
Zwieback, 1 oz.
Butter, 5 dr.
8 A. M.: Eggs, 2.
10 A. M.: Milk, 6 oz.
Milk sugar, 3 dr.
Milk rice, 5 oz.
12 M.: Eggs, 2.
2 P. M.: Milk, 7 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
Zwieback, 1 oz.
Butter, 5 dr.
4 P. M.: Eggs, 2.
6 P. M.: Milk, 7 oz.
Milk rice, 5 oz.
Milk sugar, 4 dr.
8 P. M.: Eggs, 2.
10 P. M.: Milk, 8 oz.
TOTAL: Eggs, 8.
Milk, 34 oz.
Milk sugar, 13 dr.
Milk rice, 10 oz.
Zwieback, 2 oz.
Raw beef, 4 oz.
Butter, 10 dr.
Calories, 2491.

Twelfth Day

6 A. M.: Milk, 6 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
4 P. M.: Eggs, 2.
6 P. M.: Milk, 7 oz.
Milk sugar, 4 dr.

Zwieback, 1 oz.
Butter, 5 dr.
8 A. M.: Eggs, 2.
10 A. M.: Milk, 6 oz.
Milk rice, 5 oz.
Milk sugar, 3 dr.
12 M.: Eggs, 2.
2 P. M.: Milk, 7 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
Zwieback, 1 oz.
Butter, 5 dr.
Milk rice, 5 oz.
8 P. M.: Eggs, 2.
10 P. M.: Milk, 8 oz.
TOTAL: Eggs, 8.
Milk, 34 oz.
Milk sugar, 13 dr.
Milk rice, 10 oz.
Zwieback, 2 oz.
Butter, 10 dr.
Raw beef, 4 oz.
Calories, 2491.

Thirteenth Day

6 A. M.: Milk, 6 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
Zwieback, 1½ oz.
Butter, 6 dr.
8 A. M.: Eggs, 2.
10 A. M.: Milk, 6 oz.
Milk sugar, 3 dr.
Milk rice, 5 oz.
12 M.: Eggs, 2.
2 P. M.: Milk, 7 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
Zwieback, 1½ oz.
Butter, 6 dr.
4 P. M.: Eggs, 2.
6 P. M.: Milk, 7 oz.
Milk sugar, 4 dr.
Milk rice, 5 oz.
8 P. M.: Eggs, 2.
10 P. M.: Milk, 8 oz.
TOTAL: Eggs, 8.
Milk rice, 10 oz.
Milk, 34 oz.
Zwieback, 3 oz.
Milk sugar, 13 dr.
Raw beef, 4 oz.
Butter, 12 dr.
Calories, 3007.

Fourteenth Day

6 A. M.: Milk, 6 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
Zwieback, 2 oz.
Butter, 6 dr.
8 A. M.: Eggs, 2.
10 A. M.: Milk, 6 oz.
Milk sugar, 3 dr.
Milk rice, 5 oz.
12 M.: Eggs, 2.
2 P. M.: Milk, 7 oz.
Milk sugar, 3 dr.
Raw beef, 2 oz.
Zwieback, 2 oz.
Butter, 6 dr.
4 P. M.: Eggs, 2.
6 P. M.: Milk, 7 oz.
Milk sugar, 4 dr.
Milk rice, 5 oz.
8 P. M.: Eggs, 2.
10 P. M.: Milk, 8 oz.
TOTAL: Zwieback, 4 oz.
Butter, 12 dr.
Milk rice, 10 oz.
Eggs, 8.
Milk, 34 oz.
Milk sugar, 13 dr.
Raw beef, 4 oz.
Calories, 3073.

We prefer the Lenhartz treatment rather than the Leube cure, for a restriction to a liquid diet is often unnecessary, quite distressing to the patient, and leads to great loss of flesh, weakness, and anemia. This treatment is especially useful in cases accompanied by hemorrhage. Quite satisfactory results are, however, often obtained by the Leube treatment, and at times, on account of the severe nausea, vomiting, and pain, one is forced to follow this form of treatment.

According to our observation of 521 cases of ulcer treated by the rest cure, of which 404 underwent the Leube treatment and 117 the Lenhartz treatment, 72 per cent. recovered by the Leube cure and 66 per cent. by the Lenhartz. This is in comparison from 40 to 50 per cent. of cures of cases treated as ambulatory cases, and 71 per cent. treated surgically. It is evident that when an ulcer patient is

treated medically he should be thoroughly treated, and ambulatory treatment should, if possible, not be instituted. We also maintain the belief that many ulcer cases do not recover because the treatment is not sufficiently prolonged, and in some cases the rest cure should be extended to six or even eight weeks.

Recently Sippy has evolved a method of treating peptic ulcer which according to our observations in a large number of cases has yielded the most gratifying results.

Inasmuch as it is generally admitted that a peptic ulcer heals if its surface is not continuously exposed to the digestive action of the gastric juice, Sippy's treatment consists in protecting the ulcer from the acid corrosion, until it is healed by shielding it from the corrosive effect of the gastric secretion. He accomplishes this by maintaining a neutralization of the free hydrochloric acid from early in the morning until late at night, usually from seven A. M. until ten thirty P. M., or during the entire period when food or gastric secretion is in the stomach.

If an excessive secretion is present at night this is removed by aspiration, until the secretion has disappeared.

The neutralization is effected by frequent feedings and the administration of alkalis, given freely and at frequent intervals. Nourishment is given from the very onset of the treatment, the preliminary starvation and administration of nutrient enemata common to other forms of medical treatment, are of little value, according to Sippy. The patient remains in bed for three to four weeks. Three ounces of a mixture of equal parts of milk and cream are given every hour from 7 A. M. to 7 P. M. After two or three days soft eggs and well cooked cereals are gradually added until in ten days the patient receives 3 ounces of milk and cream mixture every hour, three or four boiled eggs and 9 to 12 ounces of a cereal each day. Cream soups of various kinds, vegetable purées, and other soft foods may be substituted now and then as desired. One egg is given at a time, and three ounces of a cereal at a single feeding, the cereal being measured after it is prepared. The cereal and eggs are given alternately, and taken at the same time as the three ounce mixture of milk and cream.

The total bulk of each feeding should not be over six ounces. After a longer or shorter period according to the condition of the patient, a large variety of soft and palatable foods may be used such as: jellies, marmalades, custards, creams, etc. The basis of the diet, however, should be milk and cream, eggs, cereals, vegetable purées and bread and butter. Alkalis are administered from the very beginning of the treatment, between the feedings, to neutralize the acid secretion; powders consisting of heavy calcined magnesia, 10 grains with sodium bicarbonate 10 grains, being alternated with powders of bismuth subcarbonate 10 grains, and sodium bicarbonate 30 grains. It is also advisable to give the powders every half hour after the last night feeding for a number of doses. According to Sippy, if an

adequate quantity of alkali is utilized on aspirating the stomach, no free hydrochloric acid will be found at any time during the period in which it contains food. If the acidity is not promptly controlled by giving the usual amount of alkali, the dose is gradually increased by adding 10 grains of sodium bicarbonate to each powder, until the acidity is controlled.

The after management of these patients is important; the hourly feedings and alkaline powders must be continued even after the patient is pursuing his regular occupation. If this be impossible, he may be allowed a light breakfast of from ten to twelve ounces consisting of cereal, eggs, bread and butter, or any soft food. A thermos bottle containing equal parts of cream and milk can be utilized for conveniently supplying the hourly feedings. Three to four ounces can be taken hourly until noon, when a light luncheon may be taken, consisting of easily digestible meats. During the afternoon, three to four ounces of milk and cream should be taken hourly until the evening meal. The total bulk of food should not be sufficient to cause a greater increase in weight than is desired. If, for any special reason, the hourly feedings cannot be maintained, the three usual meals should be substituted, and the powders taken every hour for three doses after a light breakfast; one hour after luncheon a powder should be taken, two powders at the end of the second and third hours, and one at the end of the fourth hour.

At the end of from ten to twelve weeks, the feedings may be increased to two hour intervals, and the powders continued midway between the feedings. About twice the amount of food should be taken, at each feeding, and two powders midway between the feedings. At the end of twenty or more weeks, the patient may partake of three meals daily and may be allowed a glass of equal parts of milk and cream, midway between breakfast and luncheon—and between luncheon and dinner; two powders should be given between breakfast and the milk and cream and two powders between the milk and cream and luncheon. Similarly, two powders should be taken between the afternoon feedings, and two powders, one and two hours after the evening meal, and again two powders three hours after the evening meal.

Sippy advises that it is best to continue the five feedings each day with powders between as directed, beginning with the twentieth week of treatment, for a period of four to five months longer. He maintains that no possible harm can be accrued, even after the ulcer has healed. All danger that might arise from the continued use of the alkali, can be overcome by interrupting the administration of the powders for a week at the end of each five to six weeks period.

Sippy advises the same character of treatment for peptic ulcer causing pyloric obstruction as for those not causing obstruction. In about one case in ten he maintains that the obstruction is occasioned by an anatomic narrowing due to the tissue infiltration produced by

the ulcer. In these cases, the treatment differs from that of the non-obstructive type, in that larger amounts of the alkaline powders are required, and that aspiration of the stomach is indicated each night, a half hour after taking the last powder. Sippy prescribes as much as 100 grains of sodium bicarbonate every hour between the feedings, and every half hour after the last feeding until 10 P. M., to overcome the free acid. Ordinarily, ten to thirty grains added to each powder is sufficient to produce a favorable result.

It may be necessary, according to this writer, to aspirate again at twelve or one o'clock at night, and to repeat the aspiration at four or five A. M.

Usually, after a third or fourth night of this treatment, there is no longer an excessive secretion after midnight.

Sippy orders a seven hour motor meal at the end of a week or two, to determine whether the stomach has improved in its power to empty itself. He finds that in most instances of ulcer associated with pyloric obstruction, the degree of retention is greatly reduced after a week or two of treatment, and that many of these cases can be effectually cured by this plan of treatment, without surgical intervention.

While we have found the Sippy cure of the greatest help in the treatment of peptic ulcer, we cannot agree with the author of this plan of treatment, that any method of treatment other than surgical intervention can be of any permanent help in cases of pyloric obstruction produced by organic disease.

In a study of 452 cases of ulceration treated by us according to the Sippy cure, there were 94 per cent. of cures in the mild cases, 8.5 per cent. in the moderately severe cases, and 80 per cent. in the severe cases, an average of 86 per cent. of cures in all cases. When we compare these results with those obtained from other methods of treatment (see Lenhartz's Diet) there appears to be a marked advantage in favor of the Sippy cure. While we fully realize that statistical reports in ulcer cases are of but minor importance, inasmuch as it is quite impossible in such series of cases to compare the result of treatment of cases of equal intensity, yet they indicate in a general way the overwhelming advantage of the Sippy treatment over all other forms of medical cure.

The following diet list presents our method of feeding during the Sippy Cure. Either sodium bicarbonate with calcined magnesium or sodium bicarbonate with calcium carbonate are given alternately on the half hours from 7.30 A. M. to 10.30 P. M.

Hour A. M.	*Days.* *1 to 5.*	*Sixth.*	*7 to 8.*	*9 to 10.*	*11 to 14*
7	Milk and Cream	Soft egg Milk and Cream	Milk and Cream	Cereal Milk and Cream	Soft egg Cereal Milk and Cream
8	Milk and Cream	Milk and Cream	Milk and Cream Soft egg	Milk and Cream	Milk and Cream

Hour A. M.	*Days.* *1 to 5.*	*Sixth*	*7 to 8.*	*9 to 10.*	*11 to 14.*
9	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
10	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
11	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
12	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
P. M. 1	Milk and Cream	Milk and Cream	Soft egg Cereal Milk and Cream	Cereal Egg Cocoa	Egg Cocoa Custard
2	Milk and Cream	Milk and Cream	Soft egg Milk and Cream	Milk and Cream	Milk and Cream
3	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
4	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
5	Milk and Cream	Milk or cocoa Soft egg	Cereal Milk and Cream	Milk Toast Egg and Cocoa	Milk Toast Egg and Cocoa
6	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
7	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream

Milk and Cream each 1½ oz.

Hour. A. M.	*Days.* *15th.*	*16th.*	*17 to 18.*	*19th.*
7	Egg, cereal Milk and Cream	Egg, cereal Milk and Cream	Soft egg Cereal, Cocoa	Milk and Cream
8	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
9	Milk and Cream	Milk and Cream	Milk and Cream	Chicken broth
10	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
11	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
12	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
P. M. 1	2 eggs, cocoa Milk Toast	Egg, milk Cream-milk Toast, Vanilla Ice-cream	Minced chicken, Milk, Milk Toast, Vanilla Ice-cream	Minced chicken, Cocoa, Dry Toast, Vanilla Ice-cream
2	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
3	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
4	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream

Milk and Cream each 1½ oz.

Hour. P. M.	*Days.* *15th.*	*16th.*	*17 to 18.*	*19th.*
5	Milk Toast Egg, cocoa	Milk Toast Egg, cocoa	Milk Toast Egg, cocoa	Milk Toast, Egg, cocoa
6	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream
7	Milk and Cream	Milk and Cream	Milk and Cream	Milk and Cream

Hour. A. M.	*Days.* *20th.*	*21st.*	*22nd on*
7	2 eggs, Cocoa 1 slice dry toast Butter	2 eggs, 1 slice toast Butter	Milk and Cream
8	Milk and Cream	Milk and Cream	Milk and Cream
9	Milk and Cream Egg	Milk and Cream Egg	Cereal, Milk and Cream Egg
10	Milk and Cream	Milk and Cream	Milk and Cream
11	Broth	Milk and Cream	Milk and Cream
12	Milk and Cream	Milk and Cream	Milk and Cream
P. M.			
1	Minced chicken 1 slice dry toast, Butter, Cocoa, Spinach	1 Lamb or Mutton Chop Broiled, Dry Toast, Cocoa, Butter, Asparagus or Baked Potato	Chop or minced chicken, Dry Toast, Strained Vegetable or Baked Potato, Cocoa, Butter
2	Milk and Cream	Milk and Cream	Milk and Cream
3	Broth	Milk and Cream or Milk and Egg	Milk and Cream
4	Milk and Cream	Milk and Cream	Milk and Cream
5	2 eggs, Cereal, Milk toast, Cocoa	2 eggs, Cereal, Milk Toast, Cocoa	Stewed Fruit or Baked Apple, 2 eggs, Cereal, Milk Toast, Cocoa
6	Milk and Cream	Milk and Cream	Milk and Cream
7	Milk and Cream	Milk and Cream	Milk and Cream

Milk and Cream each 1½ oz.

Modified Sippy Diet followed by the authors in mild cases of peptic ulcer.

7 to 9 Days

Milk	oz. 1½	Every hour on the hour from 7.00 A. M. to 7.00 P. M.
Cream	oz. 1½	
Heavy calcined magnesia	gr. x	Every two hours on the half-hour 7.30, 9.30, 11.30 A. M.
Sodium bicarbonate	gr. x	
Calcium carbonate	gr. x	Every two hours on the half-hour 8.30, 10.30 A. M. 12.30, 2.30, 4.30, 6.30, 8.30, 10.30 P. M.
Sodium bicarbonate	gr. xx	

3 to 4 Days Following

Milk	oz. 1½	7.00 A. M.–11.00 A. M.
Cream	oz. 1½	3.00 P. M.– 7.00 P. M.
Milk and egg		9.00 A. M.
or		
Oatmeal gruel		1.00 P. M.
or		
Broth		5.00 P. M.
Heavy calcined magnesia	gr. x	7.30 A. M.–11.30 A. M.
Sodium bicarbonate	gr. xx	3.30 P. M.– 7.30 P. M.
Calcium carbonate	gr. x	9.30 A. M.
Sodium bicarbonate	gr. x	1.30, 5.30, 9.30 P. M.

4 to 5 Days Following

Milk	oz. 1½	7.00 A. M., 3.00 P. M., 7.00 P. M.
Cream	oz. 1½	
Egg		9.00 A. M.
Oatmeal gruel or broth		
Milk and egg		11.00 A. M.
Milk toast, egg		1.00 P. M.
Oatmeal gruel or broth		5.00 P. M.
Heavy calcined magnesia	gr. x	7.30 and 11.30 A. M.
Sodium bicarbonate	gr. x	3.30 and 7.30 P. M.
Calcium carbonate	gr. x	9.30 A. M.
Sodium bicarbonate	gr. xx	1.30, 5.30, and 9.30 P. M.

To Be Followed for Some Weeks

Milk	oz. 1½	7.00 A. M., 3.00 P. M., 7.00 P. M.
Cream	oz. 1½	
Milk and egg		11.00 A. M.
Soft diet (without acids)		9.00 A. M., 1.00 P. M., 5.00 P. M.
Heavy calcined magnesia	gr. x	7.30, 11.30 A. M., 3.30, 7.30 P. M.
Sodium bicarbonate	gr. x	
Calcium carbonate	gr. x	9.30 A. M., 1.30 P. M., 5.30 P. M., 9.30 P. M.
Sodium bicarbonate	gr. x	
Sodium bicarbonate	gr. x	As required additionally

Rice Water Mixture of Sailer and Schnabel.—In those instances in which the milk and cream mixture of Sippy is not well borne, Sailer and Schnable (Amer. Jour. Med. Sci., July, 1923, p. 114) have advocated the employment of their rice water mixture in the treatment of gastric and duodenal ulcers. This mixture is prepared as follows:

One-half cup of rice is boiled in 5 cups of slightly salted water until soft. One quart of the water is strained off and cooled. Four tablespoonfuls of lactose, the whites of 4 eggs, slightly beaten, and ½ cup of cream are then added. The mixture is kept in a cool place. In order to increase the palatability of this mixture peppermint,

vanilla, chocolate, nutmeg, or coffee may be added, according to taste. It has been determined that a quart of this rice water mixture will yield approximately 750 calories. From 2- to 6-ounce portions of this preparation are usually taken at hourly intervals for thirteen feedings per day. After the symptoms are allayed for twenty-four hours at least the caloric value of the rice water mixture is increased by adding more cream, sugar, or whites of eggs. In a short time following this the patient is placed upon either a partial or entire milk and cream mixture, and if this is well borne, finally upon a soft and then a light solid diet. During this treatment some alkaline preparation should be administered.

Based upon established clinical histo-pathological and physiological facts, Smithies advises the following diet in ulcer. Days 1 to 7 (Time varies according to patient's condition).

By Mouth. One-half ounce warm water hourly when awake. Patient chews paraffin wax for fifteen minutes at least once in two hours. Juice of sweet orange or grape fruit occasionally.

By Rectum. Nutrient enema consisting of 50 per cent. alcohol 1 ounce, glucose syrup 1 ounce, and normal salt solution 6 ounces every four hours. The enemata are preceded by a cleansing irrigation of the colon with normal salt solution. They are given at body temperature by the drop method at the rate of from 30 to 60 drops per minute. Calories daily approximately 1000. During the first two days, tr. opii M x is added to each second enema.

Days 3 to 14 (case of average severity).

By Mouth. From 4 to 6 ounces of water gruel at temperature of 100° F. The gruel is taken slowly through a glass tube. Gruels are made from rice, cream of wheat, oatmeal, sago, corn-meal, malted milk, macaroni and vermicelli, rusks, potato, asparagus, cauliflower, beans, peas, and boiled onion. They are strained before feeding. Flavoring with coffee, chocolate, vanilla, caramel, etc., renders the cereal gruels palatable and their administration easier. To the vegetable gruels small quantities of arrowroot or cornstarch are added to secure a thin emulsion. Before each feeding, paraffin wax is chewed for five minutes. Warm water or sweet orange or grapefruit juice are allowed as desired, but never in greater quantity than 1 ounce at a time.

By Rectum. During the first two days of mouth feeding, two alcohol glucose-saline nutrient enemata are given. During the second two days, one such nutrient enema is administered. After the fourth day of mouth feeding no rectal feedings are given in the average case. Calories approximately 800.

Days 14 *to* 21.

6.30 A. M. A glass of hot water and 1 teaspoonful of non-effervescent sodium phosphate.

7.30 A. M. One ounce of sweet orange or grape-fruit juice, 2 ounces of thin cream of wheat, or farina, or well-cooked rice, or corn-meal, 2 ounces of skimmed, parboiled milk, may be taken with cereal, and if desired a small quantity of powdered sugar used. 1 zwieback with a thin layer of fresh butter, 4 ounces of parboiled skimmed milk, containing half volume of lime-water, served warm, and flavored with coffee, cocoa, caramel or vanilla.

9.30 A. M. Six ounces of thin water gruel from cereals or fresh vegetables, strained and served hot, 1 rusk or zwieback, or dry toast.

11.30 A. M. Four ounces of malted milk, whipped egg with parboiled milk, corn-starch pudding, simple custard lightly cooked.

12.30 P. M. Six ounces potato, pea, bean, or asparagus purée (strained) or vegetable broth; 4 ounces of salisbury steak (moderately well cooked) to chew; 2 ounces (cooked weight) of thin rice, sago, tapioca, or corn-starch pudding made with parboiled milk and egg yolk; 2 ounces of parboiled milk and small quantity of pulverized sugar may be eaten with the pudding; 1 rusk or zwieback, 6 ounces of parboiled milk and quarter volume of lime-water flavored to taste.

4 P. M. Four ounces of water gruel from cereals, 1 very soft poached egg, 1 rusk or zwieback, 4 ounces of hot Vichy water.

6 P. M. Four ounces of whipped egg, 2 rusks or zwieback, 6 ounces of malted milk (thin), flavored to taste, or cereal water gruel or parboiled milk and quarter volume of lime-water gruel.

9 P. M. Six ounces of water cereal gruel or 4 ounces of malt marrow, 2 graham crackers. Calories approximately 1500.

Days 21 *to* 42.

6.30 A. M. Two teaspoonsful of phosphate of soda in a glass of hot water.

8 A. M. Juice of 1 sweet orange or half sweet grapefruit, or boiled prunes passed through fine colander; 2 ounces (cooked weight) of thin cereals (cream of wheat, farina, oatmeal, corn meal), 2 ounces of skimmed milk and small amount powdered sugar, 1 soft poached egg, 2 zwieback, 2 rusks or 2 thin slices of well toasted graham bread, 1 pint of hot skimmed milk, a quarter volume of lime-water flavored to taste (cocoa, vanilla, etc.).

10 A. M. One pint of hot parboiled whole milk and fifth volume of lime-water, 2 rusks or graham crackers.

12.30 noon. Four ounces of creamed soup from vegetables, strained, 6 ounces rare meat to chew, 4 ounces well-mashed potato or baked potato (mealy inside), or carrot, peas, beans, cauliflower, Brussels sprouts, or asparagus (all vegetables passed through a strainer and served with 15 grams of butter); 4 ounces (cooked weight) of pudding from rice, corn-starch, sago, tapioca, cream of wheat, or farina or four ounces of custard, pulp of sweet orange, grapefruit, or prune whip, or chew 6 ounces of watermelon or cantaloup, half pint of hot skimmed milk.

3.30 P. M. One hundred and fifty c.c. of hot whole milk and quarter volume of lime-water or 150 c.c. of malted milk or weak cocoa.

6.30 P. M. Two rusks or zwieback or 2 slices of well-toasted graham bread, 2 very soft poached eggs, 100 grams of sweet-apple sauce or 1 baked apple (omit skins), or juice of sweet orange or half of grapefruit or chew 6 ounces of melon, 1 pint of skimmed milk hot.

9 P. M. Two hundred and fifty c.c. of whole parboiled milk and quarter volume of lime-water of 250 c.c. of malted milk, hot. Calories for twenty-four hours approximately 2000.

General Diet After Three Months. If distress, patient should go back to 7 *to* 21 *day diet.*

7 A. M. One pint of skimmed milk and half gill of cream.

9 A. M. Two pieces of toast without butter, juice of one sweet orange or grapefruit or ripe melon or apple sauce or baked apple (do not eat skin) or marmalade, 1 dish or well-cooked cereal (oat-meal, farina or cream of wheat), 2 very soft poached eggs, 2 cups of hot sweetened water. The water may be made more palatable by flavoring with cocoa, tea, coffee or cream.

11 A. M. One cup of bouillon (two cubes), two graham crackers.

1 P. M. This should be heavy meal of the day. It may consist of meat (rare beef or rare hamburger steak, lamb or white meat of fowl), fish (never fried), oysters, well-cooked spinach, cauliflower, carrots, squash, peas (hulled), string beans, Brussels sprouts, baked or mashed potatoes (in moderation), rice with gravy, simple puddings made from cereals, corn-starch, gelatin, well-cooked fruit sauces, simple cakes, no white bread (all bread should be made from dark flour and should be at least one day old), 1 pint of skimmed milk taken hot.

4 P. M. One glass of hot peppermint water (20 drops of "essence" of peppermint to the glass), sweeten to taste and drink slowly, two graham crackers.

7 P. M. A light lunch consisting of vegetable soup, simple salad, toast, soft eggs, and plain puddings or cake, with or without ripe cooked fruit sauces, 1 pint of hot skimmed milk.

Bedtime. One glass of malt marrow, malted milk or hot skimmed milk. Calories approximately 3500 for twenty-four hours.

Einhorn's method of duodenal alimentation already described is a most useful and feasible method of feeding in severe forms of gastric ulcer, not yielding to other forms of treatment. By means of this

method it is possible to nourish the individual without great loss of flesh.

Einhorn uses as a nutritive medium a mixture of 200 to 240 c.c. of milk, 1 egg, 15 to 30 gm. of lactose every two hours. At times he adds cream to increase the caloric value.

In some cases his diet for duodenal feeding consists of—

7.30 A. M.:	Oatmeal gruel	180 c.c.
	One egg.	
	Butter	15 gm.
	Lactose	180 c.c.
9.30 A. M.:	Pea soup	180 c.c.
	One egg.	
	Butter	15 gm.
	Lactose	15 gm.
11.30 A. M.:	Same as 9.30 A. M.	
1.30 P. M.:	Bouillon	180 c.c.
	One egg.	
3.30 P. M.:	Oatmeal gruel	180 c.c.
	Butter	15 gm.
	One egg.	
	Lactose	15 gm.
5.30 P. M.:	Pea soup	180 c.c.
	Butter	15 gm.
	One egg.	
	Lactose	15 gm.
9.30 P. M.:	Bouillon	180 c.c.
	One egg.	
Total quantity:		
	Oatmeal gruel	360 c.c.
	Pea soup	720 c.c.
	Eggs	8
	Lactose	90 gm.
	Bouillon	360 c.c.
	Butter	90 gm.

There can be no question that relapses are frequently due to indiscretions in diet following the ulcer cure when the patient is no longer under the control of his physician. The patient should be placed upon a carefully regulated diet free from acids and indigestible foods; intermediate feedings should be prescribed and alkalies given for some months following the cure. When possible it is the authors' habit to have their patients report for re-examinations at periods of from three to four months for a year or more so as to determine the ultimate result of the treatment. We present a diet list (p. 492) which our patients follow as an after-treatment.

GASTRIC HEMORRHAGE

As soon as hemorrhage from the stomach occurs, the patient should be put to bed and not allowed to rise, even for purposes of defecating or urinating. A light ice-bag should be placed over the region of the stomach, and no food or drink whatever should be allowed; in order to quench the thirst small quantities of ice may be given the patient to suck. Nourishment must be entirely by the rectum; but even this is usually unnecessary for the first few days. In order to combat the weakness following great loss of blood salt solutions may be injected into the rectum, or if the patient is very weak, coffee, meat-juice, or whisky may be added to the enema. In very grave cases salt infusions must be resorted to, administered by subcutaneous or intravenous injections.

The salt solution enema is often best given in the form of a prolonged instillation by the drop method. After a few days nourishment may be given by means of nutrient enemata, or by the continuous feeding per rectum by the drop method.

Diet List Following an Ulcer Treatment

(In Addition to the Usual Meals Intermediate Feedings Should Be Taken)

May Take

Soups:
- Clam
- Mutton
- Barley
- Rice
- Vermicelli
- Cream
- Potato
- Pea
- Celery
- Asparagus

Fish (minced):
- Boiled
- Baked
- Broiled
- Bluefish
- Bass
- Haddock
- Halibut
- Trout
- Mackerel
- Oysters:
  - Raw
  - Steamed
  - Stewed
  - Broiled
- Clams:
  - Broth
  - Raw
  - Steamed

Meats (minced):
- Boiled
- Broiled
- Lamb
- Lamb chops
- Mutton
- Mutton chops
- Brains
- Sweetbreads

Eggs:
- Raw
- Soft boiled
- Poached
- Omelet
- Scrambled
- Shirred

Cereals:
- Rice
- Cracked wheat
- Cornmeal
- Barley
- Oatmeal
- Cream of Wheat
- Farina
- Hominy
- Grits
- Shredded wheat

Poultry:
- Boiled
- Broiled
- Roasted
- Chicken
- Turkey
- Squab

Milk:
- Whole
- Skimmed
- Whey
- Curd
- Junket
- Matzoon
- Kumiss
- Kefir
- Cream
- Pasteurized
- Buttermilk

Ice cream:
- Vanilla

Farinaceous food:
- Cornstarch
- Tapioca
- Sago
- Vermicelli

Bread:
- Stale
- Toasted
- Pulled
- Wheat
- Zwieback
- Crackers

Butter

Vegetables:
- Asparagus
- Spinach
- Cauliflower
- Squash
- Watercress
- Potatoes:
  - Mashed
  - Baked
- Carrots
- Artichokes
- Lima beans
- Lentils
- Peas
- String beans

Fruits:
- Pears, stewed
- Peaches, stewed
- Prunes
- Apples:
  - Stewed
  - Baked

Beverages:
- Barley-water
- Oatmeal-water
- Rice-water
- Albumen-water
- Tea (weak)
- Coffee
- Cocoa

Desserts:
- Puddings
- Rice
- Blanc mange
- Cornstarch
- Bread
- Tapioca
- Cup custard

Mineral waters:
- Vichy
- Hawthorne
- Lithia
- Apollinaris
- White Rock
- Poland

Articles of Diet to Be Forbidden

- Candies
- Salads
- Fried foods
- Alcoholic stimulants
- Sweet potatoes
- Strong tea
- Strong coffee
- Cabbage
- Salted fish
- Smoked fish
- Sardines
- Salmon
- Preserved fish
- Beef
- Pork
- Veal
- Crabs
- Rice soups
- Liver
- Kidneys
- Duck
- Corn
- Goose
- Potted meats
- Corned meats
- Stews
- Hashes
- Sausage
- Twice cooked meats
- Celery
- Beets
- Radishes
- Hot cakes
- Hot bread
- Berries
- Bananas
- Melons
- Oranges
- Grape-fruit
- Lemons
- Preserves
- Pastry
- Pies
- Nuts
- Tomatoes

Bourget has advised his iron chlorid gelatin in cases of gastric hemorrhages. This mixture is prepared as follows: 100 grams of gelatin are dissolved by moderate heat in 100 grams of glycerin and 100 grams of water; when thoroughly liquefied, 50 grams of tincture of chlorid of iron is quickly added. A precipitate is formed by coagulation, the entire mass is heated gradually, and stirred until it is homogeneous; it is then allowed to run over metal plates divided into small squares of one centimeter. Two or three tablets are taken several hours after meals. Bourget orders the following diet in gastric hemorrhage:

8 A. M.:	Milk and rolls.
10 A. M.:	Chlorid of iron gelatin tablets.
10.30 A. M.:	100 to 100 c.c. of Bourget's alkaline water (8 gm. sodium bicarbonate, 4 gm. sodium phosphate, and 2 gm. sodium sulphate in each liter).
12 A. M.:	Milk with rice.
3 P. M.:	Chlorid of iron gelatin tablets.
3.20 to 4 P. M.:	150 c.c. alkaline water.
6 P. M.:	Milk and rice.
9 P. M.:	Chlorid of iron gelatin tablets.
10 P. M.:	100–150 c.c. alkaline water.

In some hemorrhages Bourget administers the gelatin only after lavage of the stomach with a 1 per cent. chlorid of iron solution. The results following the treatment are most favorable.

Hot-water enemata have also been employed for the control of gastric and duodenal hemorrhage. A pint of water at a temperature of 120° F. is administered three times daily; this is said to cause a reflex anemia in the upper intestine, and this acts favorably on the hemorrhage.

Kemp also advises the administration of gelatin in gastric hemorrhage. He orders 1 to 2 drams of a 5 to 10 per cent. solution of sweetened gelatin given cold every half hour for 10 to 12 hours even if there be vomiting; after this the gelatin is continued in ½ to 1 oz. doses every 2 to 3 hours in addition to the albumin of 2 raw eggs beaten up and placed in a cup on ice and given in divided portions. Gelatin treatment is continued for a week. The gelatin may also be used as an enema in 1 to 2 per cent. solutions, or it may be taken internally, a tablespoonful of a 10 per cent. solution being given every three hours.

The method of utilizing gelatin for controlling gastric hemorrhage, recommended by Clement R. Jones, has been found exceedingly useful by us. To 1 teaspoonful of gelatin (Knox) of the consistency of molasses when cold are added 15 to 20 drops of adrenalin (1:1000), mixed at the time of administration. This mixture is to be given at two- or three-hour intervals.

After the cessation of the hemorrhage for a few days feeding by mouth may be instituted, beginning with small amounts of milk and gradually increasing in quantity.

DIET IN CARCINOMA OF THE STOMACH

Boas divides the treatment of cancer of the stomach into the treatment of cancer of the cardiac portion of the stomach and that of the body of the stomach.

In the treatment of **cancer of the cardiac portion of the stomach** the diet should be such as will prevent, so far as possible, any irritation of the diseased and stenosed esophagus and stomach. Solids should, therefore, be avoided. Milk is the food that is usually best borne in this disease. It can be rendered more nutritious by the addition of somatose, Nestlé's food, eggs, and the like. Besides this, broths of all kinds, cocoa, milk with tea or coffee, or buttermilk may be given. Mehring's Vigor Chocolate is useful for supplying fat.

As soon as difficulty arises in swallowing liquids, gastrotomy should be performed, in order to supply the nourishment which it is impossible to pass in through the esophagus. If this procedure is deemed inadvisable, nutrient enemata may be resorted to.

In the dietetic treatment of **cancer of the body of the stomach** milk likewise forms the most important article of diet. The more easily digestible forms of meat, such as sweetbreads, scraped beef, brains, and stewed chicken, are permissible. In this disease there is usually a distaste for meat, and fish may be substituted for it; of these, boiled mackerel, rock, haddock, or trout are to be recommended. Of the vegetables, mashed potatoes, spinach, carrots, peas, beans, cauliflower, if mashed and strained so as to rid them of cellulose, are admissible; rice, farina, and cornstarch with milk are also valuable forms of food.

In cases of cancer of the stomach too abundant a diet should not be insisted upon, as at best but little can be gained by this method of treatment.

Milk with tea, coffee or cocoa, or wine or whisky, may be given for the thirst. The food value of these liquids may be increased by the addition of preparations such as somatose, nutrose, etc. Fluids should, however, be taken in small quantities at a time. In order to supply the necessary quantity of fat, butter or Mehring's Vigor Chocolate is to be recommended. In these cases it is often important to promote the general nutrition by means of rectal alimentation. The taste of the patient should be consulted in prescribing the diet in this disease, and various delicacies to tempt the appetite should be served, care being taken to avoid monotony in food and endeavoring to overcome the distaste for it. It is possible often by careful attention to the diet to maintain a good state of nutrition in these patients for a considerable period of time.

Diet-list for Cancer of the Stomach, as given by Boas.

		Calories.
8 A. M.:	100 gm. milk and tea (67.5), 50 gm. zwieback (174.8), 10 gm. butter (71.3)	336.60
10 A. M.:	100 gm. broiled perch	71.80
	50 gm. toasted bread	129.90
	or 100 gm. calves' brain (140), sweetbread (90), 2 eggs (160).	
12 o'clock:	150 gm. milk and rice	260.00
	100 gm. veal	142.45
	50 gm. macaroni	126.30
3 P. M.:	100 gm. tea and milk (67.5), 50 gm. cakes (187)	254.50
7 P. M.:	100 gm. cream	214.60
	50 gm. zwieback, 10 gm. butter (71.3), 30 gm. ham (131)	376.30
9 P. M.:	50 gm. cream	107.30
	Total	2016.75

Diet-list of Wegele for Cancer of the Stomach.

		Albumin.	Fat.	Carbo-hydrates.	Alco-hol.
Morning:	150 gm. maltoleguminose cocoa	6.0	4.00	13.5	
Forenoon:	200 gm. kefir	6.6	4.50	3,8	1.0
Noon:	150 gm. maltoleguminose soup	4.0	0.150	9.3	
	100 gm. scraped beef	20.0	6.00		
Afternoon:	150 gm. maltoleguminose cocoa	6.0	4.00	13.5	
Evening:	100 gm. scraped ham	25.0	8.00		
	150 gm. tapioca	7.0	5.00	8.0	
10 o'clock:	200 gm. kefir	6.6	4.50	3.8	1.0
	with the cocoa, 30 gm. honey	0.4	...	22.0	
	with the kefir, 20 gm. cognac	...	...	...	14.0
During the day:	50 gm. zwieback	6.6	1.00	35.0	
	Total	87.6	37.15	108.9	16.0
	Calories	360	350	450	100
	Entire number of calories				1260

Cohnheim's Dietary in Cases of Gastric Cancer.

7 A. M.:	Milk soup, cooked with cream and butter. Biscuits with butter.
9.15 A. M.:	Tea and cream, butter rolls, scraped ham, and a soft egg.
12 M.:	Rice broth or soup; purée of spinach, carrots, or peas; chopped chicken, broiled calves' brains or fish; and some sweet fruit sauce.
3 P. M.:	Cocoa with cream and butter cakes.
5.30 P. M.:	A cereal soup or broth, containing much butter.
7.15 P. M.:	Tea with plenty of cream, scraped ham, and butter rolls.

Zweig's Diet in Gastric Carcinoma.

		Calories.
Breakfast:	½ liter milk; 40 gm. toast; 10 gm. butter	504.0
Luncheon:	Oatmeal soup; 15 gm. purée	90.0
Noon (dinner):	Vegetable green soup, 1 yolk of egg; 150 gm. roast beef, game, fowl or fish, finely hacked; 40 gm. toast; 100 gm. mashed potatoes	667.4
Afternoon:	¼ liter milk cocoa, 1 yolk of egg; 30 gm. zwieback	400.0
Evening (supper):	Flour milk gruel, viz., 250 gm. milk, 20 gm. tapioca, oatmeal, or mondamin, 15 gm. sugar; 50 gm. toast.	320.0
		1981.4

The authors have found the following diet-list useful in many cases of cancer of the stomach:

Diet Table for Cancer of the Stomach

		Calories
7.30 A. M.:	20 gm. milk with tea or coffee	135
	2 soft-boiled eggs	160
	50 gm. of toast	130
	10 gm. of butter	80
10.30 A. M.:	40 gm. orange juice	88
	30 gm. toast	77
	10 gm. butter	81
12.30 P. M.:	Bouillon	0
	100 gm. squab (or calves' brains, sweetbreads, or chicken)	100
	100 gm. mashed potatoes	127
	20 gm. toast	52
	100 gm. spinach or asparagus	166
4.00 P. M.:	200 gm. cocoa with milk	180
7.00 P. M.:	200 gm. milk	180
	100 gm. boiled rock fish	80
	50 gm. toast or cereal	130
	10 gm. butter	80
	Total	1846

DIET IN GASTROPTOSIS AND ENTEROPTOSIS

While the treatment of gastroptosis and enteroptosis is mainly mechanical,—requiring the use of well-fitting abdominal bandages, massage, and electricity,—much can be accomplished by proper care in the diet. Remarkable results are frequently obtained from rest cures, the patient being compelled to remain in the recumbent position for a long period of time and to take large quantities of food. This form of treatment, resorting at times to forced feeding or a food cure, is especially necessary in individuals who have become greatly emaciated. Patients afflicted with these conditions should lie down after eating. The diet should be very nourishing, and should contain somewhat large proportions of fatty foods. Milk is an excellent food in many cases, and, where it is well borne, cream may be added to it to increase its caloric value, and may be taken in large quantities. When milk is not well borne, solid foods must be administered. Of these, all forms of digestible meats can usually be allowed, such as chicken, roast-beef, broiled steak, and lamb-chops; fish of various kinds and digestible vegetables are also permissible; of the vegetables especially to be recommended are spinach, carrots, asparagus, and cauliflower; of the fats, butter, cream, and Mehring's Vigor Chocolate are particularly useful.

In order to overcome the severe constipation accompanying these conditions, foods that excite intestinal peristalsis are especially to be recommended; among these may be mentioned cider, buttermilk, grape-juice, fruits, and honey. The object of the so-called forced feeding or food cure is to increase the body-weight until it corresponds with the weight of the individual in health. Boas advises that the patient be kept in bed for four to five weeks, a varied diet being insisted on, and nourishment supplied every two hours. Boas be-

lieves that better results are obtained if instead of administering large quantities of milk, cream (from ½ to 1 liter daily) be given in quantities of from 150 to 200 c.c.

Strauss reports favorable results from the following alimentation as a food cure in enteroptotic and neurasthenic patients:

Breakfast:	Flour soup rich in butter, porridge, cocoa with milk-and-cream mixture, egg, and some buttered rolls.
Dinner:	Dishes made of flour and eggs and cream.
In the Afternoon:	Crackers with milk-cream mixture, zwieback, and butter.
Supper:	Should consist of the rich flour soups, or dishes made from flour and eggs, with a beverage of tea and milk-cream mixture.

Before going to bed the patient is permitted a glass of milk-cream mixture. In addition, side-dishes of malt-extract and fruit-juices may be permitted.

Zweig's Food Cure Diet in Cases of Enteroptosis.

		Calories.
8.00 A. M.:	½ liter of milk, with tea,	
	50 gm. white bread,	
	20 gm. butter,	
	30 gm. honey	680
10.00 A. M.:	¼ liter kefir (one day old),	
	50 gm. Graham bread,	
	20 gm. butter	420
12.30 noon:	150 gm. meat or fish,	
	250 gm. vegetables,	
	50 gm. apple-sauce,	
	1 omelet from two eggs,	
	10 gm. butter,	
	10 gm. sugar,	
	Fruit: grapes, oranges, figs	900
4.00 P. M.:	1 liter milk.	
6.00 P. M.:	½ liter milk chocolate,	
	50 gm. Graham bread,	
	20 gm. butter,	
	Tablespoonful of honey	1020
8.00 P. M.:	2 eggs,	
	100 gm. meat, fowl, or fish,	
	50 gm. preserves,	
	100 gm. vegetables,	
	50 gm. Graham bread,	
	20 gm. butter,	
	20 gm. soft cheese	1190
	¼ liter milk.	
9.30 P. M.:	¼ liter kefir.	
	Total	4210

DIET IN NERVOUS GASTRIC DISORDERS

Nervous Anorexia.—In this condition it is important to isolate the patient from his family. Milk, in gradually increasing quantities, and, if possible, other foods, should be given. If the patient does not take sufficient nourishment, nutrient enemata should be administered, or the patient may be fed by means of the stomach-tube. The food should be given in as concentrated and nutritious a form as possible; for this purpose eggs are suitable. Somatose should be

added to the milk. Frequently cases of anorexia are completely cured by a well-regulated rest cure of from six to ten weeks' duration. Excellent results are obtained by duodenal feeding.

Nervous Vomiting.—This is often overcome merely by isolation and change of scene. In severe cases patients should be placed in bed; they are best fed on semisolid or liquid food, since the latter is more easily retained than solid food. It should be given in very small quantities; scraped beef, eggs, rice, and toast are especially useful. Cracked ice will often afford relief. The most indigestible forms of foods are frequently well borne when the most digestible are speedily vomited. In severe cases the patient should be fed for some days exclusively by rectal alimentation or duodenal feeding should be practised. The most gratifying results are obtained by means of the last-mentioned form of treatment.

Nervous Subacidity and Anacidity.—The food should be given in small quantities and frequently. The diet need not be limited to carbohydrate food, but should be a mixed one, since the intestine takes up the work of the stomach in digesting the protein food. A more extensive description of the diet to be used will be found in the section on the Diet in Achylia Gastrica.

Diet in Nervous Dyspepsia.—In this condition the diet should not be too restricted. Strengthening food, without any attempt at a too rigorous diet, should be prescribed. The patient must be impressed with the idea of the importance of consuming as much food as possible. In those cases in which milk is well tolerated it should be given in large quantities; when it is not well borne, buttermilk, kefir, or kumiss may be substituted for it. The patient's appetite should be humored, and he should be allowed to eat any food he can digest. Alcoholic stimulants should be prohibited, or given only in very small quantities. In severe cases a well-conducted rest cure will produce the best results; but often change of scene, relief from cares, or exercise in the open air will bring about a cure.

Diet as Recommended by Burkart for Nervous Dyspepsia.

(For the first six days of treatment.)

7.30 A. M.: ½ liter milk and 2 zwieback.
10 A. M.: ⅓ liter milk and 1 zwieback.
12.30 P. M.: A plate of soup with 1 egg, 50 gm. broiled meat, and mashed potatoes.
3.30 P. M.: ½ liter milk and 1 zwieback.
5.30 P. M.: ½ liter milk and 2 zwieback.
8 P. M.: ½ liter milk, 50 gm. broiled meat, with bread and butter.
Total calories 4600.

Diet as Recommended by Burkart for Nervous Dyspepsia.

(For ninth to fifteenth day of treatment.)

7.30 A. M.: ½ liter milk and 2 zwieback.
8.30 A. M.: Coffee and cream, bread and butter.
10 A. M.: ⅓ liter milk and 2 zwieback.
12 M.: ½ liter milk.

1 P. M.: Soup with egg, 100 gm. meat, mashed potatoes, 75 gm. prunes.
3.30 P. M.: ½ liter milk.
5.30 P. M.: ½ liter milk, 2 zwieback.
8 P. M.: ⅓ liter milk, 60 gm. bread and butter.
9.30 P. M.: ⅓ liter milk, 2 zwieback

Diet as Recommended by Burkart for Nervous Dyspepsia.
(After the fifteenth day.)

		Protein.	Fat.	Carbo-hydrates.
7 A. M.:	500 gm. milk	17.0	18.2	24.0
	small cup of coffee or tea (20 gm. cream)	0.7	5.0	0.7
	80 gm. cold meat	30.8	2.0	
8 A. M.:	Milk-toast	4.5	0.5	29.0
	20 gm. butter	0.3	16.6	0.1
	100 gm. baked potatoes	1.8	10.0	25.0
10 A. M.:	300 gm. milk	10.2	10.9	14.4
Noon:	300 gm. milk	10.2	10.9	14.4
	200 gm. soup	2.2	4.0	11.4
	200 gm. beef	76.4	5.4	
1 P. M.:	200 gm. potatoes	6.2	1.7	42.6
	125 gm. prunes	0.4	...	8.3
	200 gm. of farinaceous food of any kind	12.8	21.2	45.0
3.30 P. M.:	500 gm. milk	17.0	18.2	24.0
	300 gm. milk	10.2	10.9	14.4
5.30 P. M.:	80 gm. cold meat	30.8	2.0	
	Milk-toast	4.5	0.5	29.0
	20 gm. butter	0.3	16.6	0.1
8 P. M.:	80 gm. broiled meat	30.8	2.0	
	40 gm. zwieback	0.6	5.2	33.2
	500 gm. milk	17.0	18.2	24.0
9.30 P. M.:	500 gm. milk	17.0	18.2	24.0
	20 gm. zwieback	0.3	2.6	16.6
		295.0	199.8	380.2

Diets in Nervous Dyspepsia as Advised by Boas as a Fattening Cure.

7 A. M.: ¼ liter chocolate with cream, 3 to 4 zwieback or rolls, 20 to 30 grams of butter.
10 A. M.: Cold or warm meat, eggs, egg dishes, wheat bread, 20 grams butter, 150 grams cream, preserves, or stewed fruit.
1 P. M.: ¼ liter soup, potatoes, or other vegetables in purée form, meat or fish, salad, stewed fruit (sweet), or raw fruits.
4.30 P. M.: Coffee or tea with cream, 150 grams zwieback, crackers, butter, 20 grams of honey.
8 P. M: Egg or egg dishes, wheat bread, Graham bread, butter 30 grams, stewed fruit, two glass of fruit wine, or one bottle of malt beer.
9.30 P. M.: 200 grams cream, with two to three crackers, or zwieback with butter.

In this diet cream is used instead of milk, the chief dependence being placed upon the digestible fats.

DIET IN HYPERCHLORHYDRIA OR HYPERACIDITY

By the term hyperchlorhydria is meant an increase in the secretion of muriatic acid in the stomach. In the treatment of this condition the main object is to prevent this increase in acid; this is best accomplished by regulation of the diet. Inasmuch as it has now been definitely determined that the symptoms ordinarily attributed to the increase in acid is not entirely due to this condition, but to other

factors as well, *i. e.,* vagatonia, much can be accomplished by diet alone in overcoming these symptoms, even though the acid content may still remain high. All irritating fluids, such as acids, including organic acids, as acetic (vinegar), citric, and tartaric acids, spices or condiments (pepper, mustard, vinegar), should be avoided, and the use of all alcoholic beverages and of hard substances, which are apt to irritate the stomach, such as nuts, should be interdicted. Food must be thoroughly masticated, and should be taken neither too cold nor too hot. The class of foods that seem to be best suited are the proteins, since they combine with and, therefore, neutralize the excess of acid; for this reason foods containing an abundance of protein, such as eggs, meat, and fish, may be given quite freely. The large amount of extractives in meat stimulate the flow of gastric juice, and, therefore, meat should be allowed only when well cooked, so as to remove the extractives. For the same reason raw beef and beef-juice should be avoided in this condition. Carbohydrates should be administered in small quantities and in the most digestible forms.

Bickel's Diet List, Presenting the Food which Slightly and the Food which Strongly Excites Gastric Secretion

Foods slightly exciting acid secretion.
- Liquids: Water, alkaline water tea, cocoa (rich in fats), milk (rich in fats), cream, and egg-albumen
- Condiments: 0.9 per cent. of salt solution.
- Solids: Cooked meats, fats of all kinds, cooked vegetables, such as potatoes, asparagus, cauliflower, spinach, white beets (all in purée), starch, sugar.

Foods strongly exciting acid secretion.
- Liquids: All alcoholic and carbonated drinks, coffee, cocoa (poor in fats), skimmed milk, beef-tea, beef extract, strongly seasoned soups, yolk of eggs, hard-boiled eggs, beef solution.
- Condiments: Pepper, cinnamon, mustard, cloves, paprika, salt in concentration.
- Solids: Raw or slightly cooked beef, dark meats, salted meats (pork, pickled meats, smoked fish), dark breads.

Fleischer has investigated the subject of the combining effect of muriatic acid with various foods; he discovered that beef, veal, ham, and mutton bind twice as much muriatic acid as do calves' brains and sweetbreads; the first-named class of meats are, therefore, most suitable in conditions of hyperchlorhydria. Inasmuch as uncooked meats tend to excite the flow of the gastric juice, they should not be taken in this condition; when meat, however, is well cooked it may be prescribed to advantage in conditions of hyperchlorhydria. In addition Fleischer mentions the following articles of foods capable of binding large quantities of muriatic acid: pork, cheese, sausage, ham, Graham bread, milk, and cocoa. Farinaceous foods are not well tolerated in this condition, and must be given either in a very digestible form or, best, combined with protein food. Only the more digestible vegetables are to be allowed, such as mashed potatoes, spinach, asparagus, peas, and carrots, strained and eaten in the form of purées. Fats tend to lessen the acidity of the gastric secretion, and are, there-

fore, to be recommended; they are best given in the form of butter, cream, olive oil, and the like. Of the fluids, alkaline mineral waters, such as Apollinaris, Vichy, and Seltzer, are especially useful; the carbon dioxide contained in these waters produces a sedative effect and lessens the secretion of acids. These waters may be used to dilute milk or wine. The following table, taken from Fleischer, shows the ability of various foods to combine with muriatic acid:

Fleischer's Table,[1] showing the Power of Foods to Combine with HCl.

Meats (100 grams).	Pure HCl.	25 per cent. HCl.	Dilute muriatic acid.
Calves' brains, boiled	0.65	2.60	5.20
Liver sausage	0.80	3.20	6.40
Calves' thymus, boiled	0.90	3.60	7.20
Meat sausage	1.00	4.00	8.00
Cervelat sausage	1.10	4.40	8.80
Blood sausage	1.30	5.20	10.40
Pork, boiled	1.60	6.40	12.80
Ham, boiled	1.80	7.20	14.40
Ham, raw	1.90	7.60	15.20
Mutton boiled	1.90	7.60	15.20
Beef, boiled	2.00	8.00	16.00
Veal, boiled	2.20	8.80	17.60
Leube-Rosenthal meat solution	2.20	8.80	17.60
Beer	0.10	0.40	0.80
Milk (analysis of different kinds)	0.36	1.44	2.80
White bread	0.30	1.20	2.40
Graham bread	0.30	1.20	2.48
Black bread (gray bread)	0.50	2.00	4.00
Pumpernickel	0.70	2.80	5.60
"Hand" cheese	1.00	4.00	8.00
Fromage de Brie	1.30	5.20	10.40
Edam cheese	1.40	5.60	11.20
"Backstein" cheese	1.70	6.80	13.60
Pea sausage	1.70	6.80	16.80
Roquefort	2.10	6.40	16.80
Swiss cheese	2.60	10.40	20.80
Cocoa	4.10	16.40	32.80

In arranging the diet for patients with hyperchlorhydria it has been found best in the authors' experience, in dealing with patients taking but little nourishment, to allow them to eat at frequent intervals; if, however, large meals are consumed, it is advisable to permit only three meals a day, allowing the stomach to rest during the intervals.

In marked forms of nervous hyperchlorhydria a purely vegetable or milk and vegetable diet has been recommended by certain writers; the vegetables should be eaten in the form of purées.

Laufer, Vincent, Enriquez, and others attach great importance to a salt-free diet in hyperchlorhydria, believing that a high percentage of muriatic acid may be reduced by a diet free of salt. Zweig comes to similar conclusions, and urges a salt-free diet in the treatment of gastric hyperacidity. There can be no question that a restricted salt

[1] Krankheiten d. Speiserohr., d. Magens, u. d. Darmes, 1896, p. 932.

diet is of advantage in the treatment of this condition. (See Salt-free Diet.)

The following tables, taken from Zweig, indicate the percentage of salt found in some forms of uncooked and cooked food:

I. Raw Food Stuffs.

	Percentage of sodium chlorid.
Milk	0.15– 0.18
Butter (unsalted)	0.02– 0.21
Butter (salted)	1.0 – 3.0
Hen's egg	0.13– 0.21
Yolk	0.039
White	0.31
Caviar	3.00– 6.18
Meat	0.10– 0.20
Calves' brains	0.29
Fresh-water fish	0.06– 0.12
Sea fish	0.16– 0.41
Smoked beef, sausage, or pickled meats	1.85–20.95
Pork	1.00
Ham	1.85– 7.50
Beef extract	1.4 –14.6
Protein preparations: Raborat	0.006
Plasmon	0.21
Somatose	0.66
Fruits, cereals, flour, vegetables, salads	0.01– 0.10
With the exception: Sago	0.19
Oatmeal	0.26– 0.29
Lentils	0.13– 0.19
Cauliflower	0.15
Spinach	0.21
Sauerkraut, pickles	0.73– 1.45
Tea and coffee	0.05– 0.15

Wine and beer contain but a trace of salt.

II. Food Already Prepared.

	In 100 gm.	Estimated in portions for a single individual.
Milk soup	....	0.7
Milk with cereal	....	1.7
Eggs: Poached	....	0.5
Scrambled	....	2.4–2.7
Bouillon	0.55–1.0	
Soup	0.35–0.90	
Sauce	0.7 –1.5	
Meat: Fillet, Roast beef		1.9–2.8
Beefsteak		3.0
Bread: Zwieback	0.38	
Wheat bread	0.48–0.7	
Rye bread	0.75	
Cooked vegetables: Cauliflower, purée of potatoes, green salad		0.5–0.9
Asparagus		2.7–3.5

The following diet has been used with advantage by the authors in cases of hyperchlorhydria:

		Calories
7.30 A. M.:	200 gm. milk flavored with tea	135
	2 soft-boiled eggs	160
	60 gm. toast	154
	40 gm. butter	326
10.00 A. M.:	50 gm. scraped beef	60
	50 gm. toast	130
12.30 P. M.:	100 gm. chicken or chops or sweetbreads	106
	100 gm. spinach or asparagus or carrots or peas	166
	100 gm. stale wheat bread	256
	100 gm. apple sauce	63
	150 gm. milk	100
	150 gm. crackers	188
7.00 P. M.:	100 gm. baked trout or other fish	106
	100 gm. milk	67
	20 gm. butter	163
	60 gm. toast	154
	Total	2334

Diet-list for Patients with Gastric Hyperacidity.—(*Biedert.*)

	Grams Protein.	Grams Fat.	Grams Carbo-hydrates.	Cal-ories.
In the morning between 7 and 8 o'clock: 500 c.c. of milk, 40 gm. toast	20.3	18.4	55.8	483
In the morning at 10 o'clock: 70 gm. of broiled veal (or 100 gm. of stewed veal without the skin, prepared as white ragout) or beefsteak or fowl, 30 gm. of toast, 1 egg, 2 zwieback (20 gm.) ⅛ of a liter of wine	32.3	12.0	36.9	395
Twelve o'clock noon: French soup, with yolk of egg	4.0	9.2	7.7	134
140 gm. of broiled or boiled fowl, roast meat, gulyás or haché, 200 gm. of raw meat as beefsteak, or 100 gm. of finely chopped boiled beef or fish	42.8	10.4	...	272
Asparagus with cream gravy (a few heads of asparagus and half a spoonful of gravy) 20 gm. of toast	2.2	1.2	16.4	87
Omelet soufflé	12.1	18.3	9.6	259
One small cup of black coffee.				
In the afternoon at 4 o'clock: 250 gm. of milk-cocoa, 3 zwieback	13.5	15.8	44.6	385
In the evening at 7 o'clock: 70 gm. of cold meat with 100 gm. of meat-jelly, 20 gm. of toast	24.2	5.4	15.4	212
20 gm. of Swiss or Dutch cheese	5.4	6.1	0.5	81
Total	156.8	96.8	136.9	2308

Diet-list for Hyperacidity.—(Wegele.)

		Protein.	Fat.	Carbo-hydrates.	Alco-hol.
Morning:	100 gm. tea with milk	3.4	3.6	4.8	
	2 soft-boiled eggs	12.0	10.0		
Forenoon:	100 gm. raw ham	25.0	8.0		
	50 cream	2.0	13.5	1.7	
	200 gm. Aleuronat meal broth (10 gm. Aleuronat to 200 broth) or 250 gm. oatmeal broth (20 gm. oatmeal to 250 broth)	10.2	1.7	8.0	
Noon:	150 gm. beefsteak	58.0	1.7	8.0	
	200 gm. mashed potatoes	6.2	3.0		
	100 gm. white wine with Saratoga, Vichy or Biliner water			3.5	8.0
Afternoon:	100 gm. tea	3.4	3.6	4.8	
	150 gm. cream	2.0	13.5	1.7	
Evening:	50 gm. cold meat	60.2	4.0		
	2 scrambled eggs, 100 gm. wine.		3.5		8.0
At meal times:	100 gm. Aleuronat toast	28.3	1.5	66.7	
10 o'clock at night:	250 gm. milk	8.5	9.0	12.0	
	Total	229.2	85.1	149.4	16.0
	Calories	940.0	790.0	600.0	112.0
	Entire number of calories				2442

Einhorn's Diet in Hyperchlorhydria.

		Calories.
7.30 A. M.:	Two eggs, 50 gm.	160
	Wheaten bread, 50 gm.	128
	Butter, 20 gm.	163
	Milk 250 gm.	169
10.30 A. M.:	Zoolak or milk 200 gm.	135
	Crackers or bread, 30 gm.	77
	Butter, 10 gm.	81
1 P. M.:	Broiled meat, 100 gm.	210
	Mashed potatoes, 50 gm.	63
	Bread, 30 gm.	77
	Butter, 10 gm.	81
	Weak tea or Vichy water, 200 gm.	
3.30 P. M.:	The same as at 10.30 A. M.	293
6.30 P. M.:	Soup (with barley or vermicelli), 200 gm.	100
	Bread and butter (bread, 30 gm.; butter, 10 gm.)	158
	Meat (broiled or cooked), 100 gm.	210
	Potatoes, baked, 50 gm.	60
	Green vegetables (spinach, green peas), 50 gm.	80
	Coffee (half milk), 100 gm.	34
10 P. M.:	Oysters and crackers, or cold meat sandwich, one glass of beer	260
		2539

DIET IN INTESTINAL DISEASES

The diet plays quite as important a rôle in the treatmen. oi diseases of the intestine as it does in the treatment of gastric disorders. In many intestinal disturbances, such as acute intestinal catarrh, diarrhea, etc., cures can often be effected by diet alone, when without this mode of treatment the disease might become intractable. The diet

in intestinal diseases, as in gastric disorders, must be such as will produce no annoying symptoms. The process of digestion in the intestine is exceedingly complicated, and therefore the digestibility of foods in this part of the alimentary tract is most difficult to determine. This subject was studied by Rübner,[1] who determined the degree of absorption of various foods in the intestine. The table below gives his results.

It is thus shown that certain forms of foods contain very large proportions of protein matter, but that their absorbability is so slight that their nutritive value is far lower than that of foods containing less protein. Thus, while peas contain considerably more protein (7 per cent.) than does milk (3.7 per cent.), a much smaller proportion of protein is absorbed in the case of the former than in that of the latter; on the other hand, the absorbability depends greatly on the mode of preparation of the food; when vegetables are mashed and then strained so as to rid them of their cellulose envelopes, they are much more readily absorbed than when eaten with the cellulose. The

Rübner's Diet in Intestinal Diseases.

Food-stuffs.	Weight of same in grams.		Absorbed in percentages of—				
	Fresh.	Dried.	Dried substance.	Protein.	Fat.	Carbo-hydrates.	Ash.
Meat	984	376	95	97	95	. .	82
Eggs	984	247	95	97	95	. .	82
Milk	2470	315	92	94–99	95–97	100	51
Milk and cheese	2490	420	94	96	97	100	74
White bread	860	753	95	81	. .	99	93
Black bread	1360	765	85	68	. .	89	64
Macaroni	695	626	96	83	94	99	76
Indian corn	750	641	93	85	83	97	70
Corn and cheese	. .	780	96	93	91	96	81
Rice	638	552	96	80	93	99	85
Peas	600	521	91	83	. .	96	68
Potatoes	3078	819	91	68	96	92	84
Cabbage	3830	406	85	82	94	85	81
Carrots	2566	352	79	61	94	82	76

digestibility of certain foods in the intestine varies greatly with different individuals. For this reason exact rules cannot be formulated in any case, but the diet must be varied according to individual peculiarities. Boas[2] has expressed his opinion on this subject as follows:

"1. In a number of intestinal diseases a change of diet is unnecessary or may even be harmful.

[1] Zeitschr. f. Biologie, vol. xv., p. 115.
[2] Diseases of the Intestine, p. 141.

"2. In some cases special dietetic restrictions are directly indicated, but these should be as few as possible.

"3. In another series of cases an abundant, heavy, not easily digestible or absorbable diet is indicated.

"4. The general aim of our treatment should always be to so manage the case before us that digestion of a normal diet will always occur in the alimentary canal without any subjective or objective disturbances. Under these circumstances only can the case be considered cured."

According to their effect on intestinal peristalsis, foods may be divided into three classes: those inducing constipation; those producing a laxative effect, and those exerting no especial effect in either direction. In the first class are those foods containing an astringent, such as tannin; among these may be mentioned certain red wines, cocoa, and tea. Rice, tapioca, barley, sago, macaroni, and potatoes have a tendency to produce constipation in many individuals.

Among the laxative foods may be mentioned fruits and certain vegetables, as cucumbers, tomatoes, and cabbage; cider, buttermilk, beer, and the carbonated waters also exert a laxative effect.

In the third class, foods that have no especial effect on the intestinal movements, may be placed meats, fish, eggs, toasted bread, and zwieback. It must be remembered, however, that certain foods that prove laxative in one individual may be constipating in another, so that no precise rules can be formulated; in each case individual tendencies must be consulted.

In severe forms of intestinal disturbances rectal alimentation must often be resorted to. For a further consideration of the technic and forms of food to be utilized in this method of feeding the reader is referred to the section on Rectal Feeding. In those cases in which food cannot be given either by the mouth or by the rectum subcutaneous feeding becomes necessary; for this purpose olive oil may be used; one ounce may be injected twice daily under the skin, best in the region of the thigh; in some cases normal salt infusions are indicated.

In determining the diet of patients affected with intestinal disturbances it is important to ascertain the physiologic activity of the intestines by means of the Schmidt test diet. By means of this method of examination of the feces one can determine which food constituent is badly digested and whether carbohydrate fermentation or protein putrefaction is present. Thus it is possible to so vary the diet, so as to prevent certain undesirable bacterial flora from multiplying to a great degree. Herter and Kendall have noted the extensive bacterial degeneration following a change from one diet to another and have concluded that in conditions of disturbances of the intestinal tract when undesirable bacteria propagate on both a protein and on a carbohydrate diet frequent changes in the diet are beneficial

by interfering with the too rapid growth of any one type of bacteria. Further, by substituting a diet of milk and sugar for meat and eggs, they were able to convert a proteolizing type of intestinal flora into an aciduric non-proteolizing form. Hull and Rettger have shown that milk owes its beneficial action to the lactose present. When lactose is taken in liberal quantities together with other food the flora shows evidence of change. Milk and lactose together form according to these investigators, the most practical and effective diet in reducing the putrefying types of bacteria.

Rettger and Cheplin have demonstrated that by feeding with culture of the Bacillus acidophilus (the organisms predominant in the intestine of nursing infants) the intestinal flora may be so altered as to convert it from a proteolytic putrefactive to a fermentative of aciduric type. A similar change may be brought about by means of feeding adequate quantities of lactose, with the result of a rapid increase in the Bacillus acidophilus forms, and finally with a reduction to a very marked degree of the putrefactive bacteria of the bowel. This change may, however, necessitate such amounts of lactose which could scarcely be continued over any great period of time. By means of from 500 to 1000 c.c. of an acidophilus culture the intestinal flora may be converted from the putrefactive type to one consisting largely of the acidophilus form, which may be continued on indefinitely by this method of feeding. Similar results may be brought about by a combination of lactose and the acidophilus culture, each in lesser quantities. It is quite probable that by means of this method of feeding a change of the intestinal flora from the putrefactive to the aciduric type may be brought about, and thus intestinal toxemia may at least to some degree be overcome.

Antiputrefactive Diet.—The most important food containing protein and yet acting in an antiseptic way is milk. It has both a high nutritive value, is easily assimilated, and yields a very small amount of products of decomposition. If it produces indigestion, as it does in some instances, this effect can be overcome by the addition of rice, oatmeal, milk of magnesia, or citrate of soda.

When milk is badly borne, one finds usually that it ferments too rapidly, and that the intestine is stimulated by the products of decomposition.

In most instances milk is the most digestible food for patients affected with intestinal disorders. However, when it is not well borne in some instances, it should be given in small quantities together with other food such as milk soups, mushes, flour-soups etc. Milk, however, should be given with caution in catarrh of the intestines, and in certain ulcerations of the large bowel. In some individuals kefir or yoghurt must be substituted. Of other preparations the artificial products such as nutrose and plamon are to be recommended. Gelatin is another food which is apt to inhibit the growth of organisms

of putrefaction in the intestinal canal and therefore must be considered a valuable form of nourishment.

As the patient improves, other articles of diet may gradually be added, but with great caution. Of these, the carbohydrate foods should be taken in the form of zwieback, crackers, wheat bread, (stale). Butter may be given in small quantities. Finally cereals may be allowed with the addition of milk and cream. Sugar should be taken in small quantities; gradually vegetables may be added, but should be mashed and strained.

When eggs are given, they should be taken with caution, in as much as patients affected with intestinal diseases, at times tolerate eggs badly. Still later on, small quantities of broiled minced meats, may be added.

The coarse shreds of connective tissue found in meats should be extracted, especially in cases of diarrhea, due to achylia-gastrica, inasmuch as these can be digested neither in the stomach nor in the bowel, and thus act as an irritant to the intestine, and at the same time become a nidus for the growth of many putrefactive organisms. Stewed fruits are permissible, the skins and seeds being first removed.

Antifermentative Diet.—By antifermentative diet we especially refer to those forms of carbohydrate food, which are least apt to cause fermentation, especially diarrhea. Fermentation is especially liable to occur in both acute and chronic catarrh of the bowels, bacteria growing upon a soil containing carbohydrates. These changes are recognized by semifluid, spongy conditions of the stools, which are highly acid. In the treatment of such cases, the quantity of carbohydrate food administered should be reduced in quantity or this article of diet entirely eliminated, and fat and proteins substituted, until the carbohydrate fermentation has disappeared. When there is, in addition to the carbohydrate fermentation, an acute or chronic intestinal catarrh, the problem of feeding sometimes becomes quite difficult.

The protein food is apt to undergo putrefaction, and the carbohydrates fermentation. At first the diet should consist of clear broths, with dry bread, or crackers. Then cereals may be added, together with milk. Finally, when this diet is well borne, the more solid foods, in the form of chicken, broiled meats, and butter, may be allowed. Milk should be taken with caution, when fermentation exists.

The Effect of Starvation on the Intestinal Flora.—According to the experiments on animals, of Cushing and Livingood and of Sisson a relative amicrobism is produced, after a period of 24 hours' starvation. The greatest diminution was observed in the duodenum, next in the ileum; a large number of organisms, however, were found in the cecum.

The number of organisms is, however, dependent on the food residue

present, absolutely sterile specimens could not be obtained. The condition produced by starvation, therefore, is according to Sisson merely one of relative amicrobism. It is also interesting to note that there is little evidence to indicate that intestinal putrefaction and toxemia can in any way be overcome by means of the administration of the so-called medicinal intestinal antiseptics.

Association of Bacterial Infection in the Bowel and the Character of the Food Supply.—In association with bacterial infection in the bowel and its dependence upon the character of the food supply, the recent work of McCarrison is of the greatest interest. This investigator, from his remarkable observations on the effect of diet in human beings as well as in animals, was able to produce by feeding with faulty food over variable periods of time, various intestinal affections, especially serious types of colitis and of intestinal stasis. He calls attention to the fact that due to this cause toxemia is produced as can be demonstrated by the changes in the mesenteric glands. In consequence, impairment of the protective resources of the intestinal walls against infection often takes place, which not only leads to infection of the mucous membrane of the intestine itself but also allows the passage into the blood-stream of micro-organisms from the bowel.

DIET IN INTESTINAL DYSPEPSIA

In intestinal dyspepsia food should be given frequently and in very small quantities. At first only the liquid forms should be used, such as weak tea, peptonized milk, malted milk, bouillon, and egg-albumin; after a few days the patient may gradually be placed on the following diet: calves' brains, sweetbreads, broiled steak or lamb chops, soft-boiled eggs, boiled fish, such as mackerel or rock, baked potatoes, spinach, asparagus, and stewed fruits.

The following list gives the general plan of a diet used by the authors in this condition.

		Calories.
8 A. M.:	150 gm. milk with tea	101
	1 soft-boiled egg	80
	60 gm. toasted wheat bread (155) with 20 gm. butter (163)	218
10 A. M.:	Scraped-beef sandwich { 100 gm. scraped beef (118); 50 gm. wheat bread (178) }	296
12 M.:	Bouillon with 5 gm. Armour's Soluble Beef	10
	100 gm. broiled chicken	106
	or 100 gm. broiled steak (209).	
	or 100 gm. lamb chop (220).	
	50 gm. mashed potatoes or 100 gm. spinach (166)	64
	100 gm. apple-sauce	88
	50 gm. wheat bread, stale or as toast	130
3 P. M.:	200 gm. milk	135
7 P. M.:	200 gm. milk with rice	253
	1 soft-boiled egg	80
	100 gm. wheat bread and 50 gm. butter	666
		2227

Edwards' Diet List for Intestinal Dyspepsia.

Clean and disinfect the mouth before eating. Small meals taken at regular intervals. Punctuality is of great importance. Masticate thoroughly; eat slowly and temperately. Food lukewarm only. Rest before and after meals.

The patient may take:

Soups: Small quantity. Clear soups of beef, mutton, and oyster. A little vermicelli or tapioca may be boiled with these. Cream pea soup, pea and tomato soup, hominy and bean soup, beef-tea with yolk of egg.

Fish: Oysters and little neck clams in any form, except fried. Weakfish, white fish, shad, cod, perch, trout, bass, smelt, mackerel, haddock, corvina, barracuda.

Meats: Meat-juice, roast or broiled beef, mutton, chicken, tripe, calf's head, venison, tongue, sweetbread. No fatty meats or sauces.

Eggs: Raw, soft boiled, poached, omelet combined with chicken or oyster. Eat dry toast or stale bread with eggs. May combine eggs with wine or brandy.

Farinaceous foods: Bread, at least one day old; brown bread, toast, rye, gluten, and Graham bread, zwieback, crackers, cream and crackers, cracked wheat, rice, sago, cornmeal, hominy, wheaten grits, vermicelli, rolled rye, rice cakes, browned rice, baked flour.

Vegetables: (Best made into purée by passing through a colander or mashing.) Greens, spinach, lettuce, watercress, French beans, green peas, asparagus, celery, artichokes, potatoes (but little). All vegetables to be used sparingly and with caution.

Dessert: Rice, tapioca, Indian and farina puddings, custards (rice, snow, rennet, sponge cake, floating island), orange charlotte, gelatin creams, blanc mange, baked and stewed apples and pears, grapes, and all ripe fruits (best stewed, but may have to avoid fruit entirely).

Beverages: (Drinks should be mostly taken near the end of meals). Water one hour before meals, milk, lime-water, weak tea (½ ounce to the pint), kumiss, weak cocoa, peptonized cocoa and milk. Mineral waters are not specially recommended. Good claret or Burgundy diluted one-half with sterile water.

The patient must avoid:

Rich soups and chowders, all fried foods, veal, pork, liver, kidney, hashes, stews, pickled and corned meats, preserved and potted meats, turkey, goose, duck, sausage, salmon, salt mackerel, bluefish, sturgeon, eels, shrimp, sardines, lobster, crabs, cabbage, cauliflower, cucumbers, parsnips, egg plant, turnips, carrots, squash, oyster plant, sweet potatoes, beets, pastry, pies, made dishes, nuts, dates, jams, dried and candied fruits, candies, cheese, whipped cream, ice cream and water-ices, ice-water, pancakes, potato cakes, pumpernickel, strong tea, malt liquors, sweet and effervescent wines, spirituous liquors, coffee.

DIET IN ACUTE INTESTINAL CATARRH

As in acute gastric catarrh so also in acute intestinal catarrh the regulation of the diet is probably the most important factor in the treatment of the disease. The patient should be kept in bed; after the bowel has been thoroughly emptied by a cathartic, liquid foods,

such as clear broths,—at first without, and then with eggs,—thin gruels, light tea, cocoa cooked in water, and egg-albumin, should be given exclusively for several days. In this condition milk should not, as a rule, be given. When there is extreme thirst, the carbonated waters may be allowed, but only in small quantities. The thirst is best relieved by placing bits of crushed ice in the patient's mouth. After the pain and discomfort have disappeared, toast, crackers, stewed chicken, soft-boiled eggs, mashed potatoes, and boiled rice may be added to the diet; indigestible foods, such as raw fruits, heavy vegetables, and fatty and acid foods should be avoided for a considerable period of time after the catarrh has disappeared.

DIET IN CHRONIC INTESTINAL CATARRH

The dietetic treatment in chronic intestinal catarrh depends upon the condition of the fecal movements; these are, in a measure, an index as to the portion of the bowel involved. According to Nothnagel,[1] cases of chronic intestinal catarrh may be divided into four groups:

"1. Cases characterized by pronounced constipation. An evacuation appears only once in two, three, or four days; sometimes only with the aid of cathartics. The fecal matter is usually hard. As a cause of the constipation, Nothnagel assumes a decreased activity of the automatic nervous apparatus of the intestines, this being the result of the catarrhal process.

"2. Cases in which constipation and diarrhea constantly alternate. For two or three days there may be a daily evacuation of very hard dejecta. On the following day there may be four to six very thin or mushy movements mixed with mucus, accompanied by violent pains, and then again constipation for a day or two, etc. Or there may be quite a normal evacuation (once daily) for a few days in succession and then again four to seven diarrheal movements in one day, and after this constipation. The principal feature of these cases is the constipation, but the excitability of the nervous apparatus being quite good, the decomposed stagnant contents often cause increased peristalsis and diarrhea. Sometimes these alternating periods of constipation and diarrhea continue for a long time. Thus the patient may be constipated for four or five weeks, or even for a few months, and then again the diarrhea may set in, lasting several weeks or months.

"3. In a very limited number of cases there is a daily evacuation, which is usually not formed or mushy.

"4. Cases in which there are for months several diarrheal evacuations daily. The dejecta, as a rule, show the biliary reaction, or they may contain yellow fragments of mucus, yellow-tinged epithelium, and round-cells. In these cases the catarrhal process affects not only the

[1] Specielle Pathologie und Therap., vol. xvii., p. 119.

large bowel, but also the small intestine. The absorption suffers, and there are more abnormal products in the contents (acids), which give rise to increased peristalsis in the small as well as large bowel."[1]

The treatment of chronic intestinal catarrh therefore resolves itself into the treatment of the accompanying chronic constipation, chronic diarrhea, or a condition of constipation alternating with diarrhea.

Diet in Chronic Constipation.—In this condition a mixed diet, containing, so far as possible, those substances that stimulate the intestinal peristalsis, should be prescribed. Astringents and anything that tends to produce constipation, such as cocoa, chocolate, tea, red wines, rice, farina, etc., should be avoided.

The following foods should be prescribed in cases of chronic constipation: Graham and rye bread with butter, fruit, buttermilk, kefir, cider, beer, fresh vegetables, as cabbage, sauer-kraut, and salads. Fats are especially to be recommended, and honey is also useful. Salts stimulate the intestinal movements, therefore foods containing salts are indicated in this condition; among this class may be mentioned herring and caviare. Sugar, especially milk-sugar, has a marked tendency to increase intestinal peristalsis. Water taken cold or on an empty stomach will also stimulate intestinal movements.

Zweig's Diet List for Chronic Intestinal Catarrh with Constipation.

Early morning:	Tea with milk, roll, butter, honey.
Morning:	One glass of sour milk, buttermilk or kefir (one day old).
Noon:	No soup.
	Meat or fish (100 gm.).
	Purée of vegetables (liberal quantity).
	Dessert (apple sauce, stewed prunes).
	Rice or tapioca pudding with sweetened fruit sauce.
	One glass of Sauterne or cider.
Afternoon:	Same as early morning.
Evening:	One egg, cold or warm meat.
	Purée of vegetables.
	Dessert.
	Roll, butter, soft cheese (camembert).
	One glass of cider.
9 P.M.:	One glass of kefir (one day old) or sour milk.

Diet in Chronic Diarrhea.—When severe symptoms, such as intense diarrhea and pain, present themselves the patient must be put to bed and kept on a very rigorous diet; the period of rest may be lengthened or shortened according to the severity of the disease. In moderately severe cases several weeks will usually suffice. Nourishment should be taken in small quantities every few hours, sufficient must, however, be given to maintain the body weight. All cold drinks or carbonated waters, fruits, cabbage, and salads are to be avoided. The most suitable foods in this disorder are broths containing barley, rice, and farina, soft-boiled eggs, sweetbreads, stewed chicken, broiled steak, boiled fish, toast, crackers, baked potatoes, tea, milk (boiled), and cocoa; in many cases port wine is quite useful, as it contains

[1] Einhorn, Diseases of Intestines, p. 100.

tannin, which acts as an astringent to the bowels. In this condition milk even when boiled is often not well borne, and must then be avoided.

The following diet-list, taken from Boas,[1] illustrates the method of prescribing nourishment in chronic catarrh of the intestine accompanied by diarrhea:

8. A. M.: Eichel cocoa (in water), one saccharin tablet (or crystallose), toast and butter (20 to 30 gm.).

10 A. M.: One cup (200 gm.) rice gruel, buckwheat, or oaten grits in veal bouillon (avoid salt). In addition: 50 gm. roasted veal or beef (scraped), fried fish or cold meat (avoid salt or strongly pickled ham).

1 P. M.: Soup of peas or beans or purée of oatmeal, farina, or cornstarch, etc. (addition of nutrose or eucasin allowed; somatose forbidden). In summer huckleberry soup (with saccharin if desired).

200 gm. of rice bouillon (avoid rice with milk) or farina bouillon, well thickened by cooking.

Green vegetables or potatoes in purée form (50 to 100 gm.), meat and fish (fat excepted) (50 to 100 gm.) (butter sauce allowed; cream sauces or highly seasoned sauces forbidden).

Stewed fruits, with the exception of huckleberries and cranberries, forbidden.

Custards (corn-starch, with a little yolk of egg and saccharin) allowed. (Avoid fruit-juices.)

As beverages: Huckleberry wine, Burgundy, Camarite, Simaruba wine, old Bordeaux. (Sweet wines, white wines, and effervescent beverages forbidden.)

4 P. M.: Tea (without milk) with saccharin or cocoa, cakes, toast, zwieback (with butter).

7 P. M.: Strained gruel (oatmeal, etc.), cold or warm meat (50 gm.), toast, butter (20 gm.).

9 P. M.: One glass of huckleberry lemonade, warmed or hot mulled wine (saccharin), or tea without red wine.

Zweig's Diet List for Chronic Intestinal Catarrh with Diarrhea.

Early morning: Acorn cocoa cooked in milk (one saccharin tablet); toast, butter.

Morning: One to two eggs, toast, butter.

Noon: Soups (rice, barley, oatmeal without salt).
Minced meat or fish (cooked in butter).
Gelatin.
Rice or macaroni.
One to two glasses of red wine.
Toast.

Afternoon: Same as early morning.

Evening: Soup.
Fish (minced).
Gelatin.
One glass of red wine.
Toast, butter.

In conditions of **chronic intestinal catarrh in which diarrhea alternates with constipation** the same plan of treatment may be followed as has been described for those cases accompanied by constipation or diarrhea; it is especially important to treat by diet the more prominent symptoms, whether it be diarrhea or constipation. Mineral waters are frequently utilized in cases of chronic intestinal catarrh.

[1] Diseases of the Intestines, p. 224.

For cases accompanied by constipation the waters of Marienbad and of Saratoga (Congress and Hathorn springs) are most beneficial. Where diarrhea is the prominent symptom, Carlsbad and Vichy are to be recommended.

DIET IN DYSENTERY

The diet in **acute dysentery** is similar to that prescribed in acute intestinal catarrh. The patient is put to bed and only liquid foods are administered. Of these the most suitable are bouillon, broth, egg-albumin, and tea; gradually, as the condition improves, semisolids, such as milk-toast, rice cooked in milk or broth, gruels of tapioca, etc., may be prescribed. Solid food should be abstained from until a few days after the disorder has abated.

In **chronic dysentery** the food should be given in small quantities at frequent intervals. All coarse, indigestible food should be avoided.. In other respects the diet is similar to that already given under Chronic Intestinal Catarrh.

Ullmann in a recent study of the sago like globules occurring in the stools in certain stages of dysentery, calls attention to the fact that these granules are composed of small masses of cellulose from the potato which have not under-gone digestion. Other materials may also be found acting as local irritants to the intestinal wall, continuing the dysenteric condition. He therefore advises the elimination of potato in all forms and of meat in any form but scraped. In place of the potato he advises gruels including those made from sago and rice. Wheat bread and zwieback may also be given.

Lassablierie has tested the effect of condensed milk and rice water in the diarrhea and dysentery of French soldiers, with exceedingly good effect. Upon admission the patients were at once placed upon a daily ration of one to two liters of a mixture of one part of condensed milk with four parts of sweetened rice water. Rice water is easily digested and well borne; while condensed milk is a valuable food requiring but little digestive activity for its proper assimilation. Rice water and condensed milk together combine many valuable properties.

In the management of the dyspepsia and malnourishment associated with chronic enterocolitis especially due to infecting protozoa, Smithies advises the following diet.

7.00 A. M.:	1 pint of skimmed milk and 2 zwieback.
9.00 A. M.:	2 pieces of well cooked toast without butter.
	Juice of 1 sweet orange or ½ grapefruit, or ½ of ripe melon, or baked apple or dish of apple sauce.
	1 dish of well cooked cream of wheat, farina or oatmeal with cream and sugar.
	2 very soft poached eggs with butter.
11.00 A. M.:	1 cup of bouillon (2 cubes) and 3 crackers.

1.00 P. M.: This should be the big meal of the day.
Meats—rare if possible—such as beef, lamb, well cooked or white meat of chicken. Any kind of fresh-water fish, but it should never be fried. Limit to 4 ounces.
Vegetables should be cooked or well washed in bacteriologically clean water. Well cooked spinach, cauliflower, carrots, squash, peas (hulled), string beans, Brussels sprouts, baked or mashed potatoes (in moderation), rice, with gravy.
Simple puddings made from cereals, cornstarch, gelatin, well cooked fruit sauces, simple cakes.
No white breads—all breads should be made from dark flour and preferably should be at least 24 hours old.
1 pint of skimmed milk taken hot.
4.00 P. M.: 1 glass of hot malted milk or parboiled whole milk or cocoa.
Two graham crackers.
7.00 P. M.: A light supper consisting of vegetable soup, toast, soft eggs and plain puddings, or sauces made from fruits.
Simple cake may be eaten if desired.
1 pint of skimmed milk and ½ gill cream taken hot.
Bedtime—1 glass of malt marrow or hot malted milk or cocoa.

DIET IN ULCERS OF THE INTESTINE

1. **Diet in Ulcer of the Duodenum.**—The diet in ulcer of the duodenum is the same as that of gastric ulcer, and the reader is referred for the details to the section dealing with this subject. In cases accompanied by hemorrhage absolute rest in bed must be insisted upon, and rectal alimentation administered if necessary. After the first week the Leube rest cure should be instituted, according to the methods described elsewhere. The first form of food to be allowed is milk; after the first week Carlsbad water should be given in the morning. In very severe cases Boas advises exclusive rectal feeding for one or two weeks. The authors have had exceedingly favorable results in the treatment of many cases of duodenal ulcer by means of the Lenhartz and the Sippy cure. (See Ulcer of the Stomach.)

2. **Diet in Other Forms of Intestinal Ulcers.**—In addition to ulcers occurring in the duodenum, tuberculous ulcers, syphilitic ulcers, toxic ulcers, amyloid ulcers, and dysenteric ulcers may occur in the intestine. In any form of ulcer the diet should be non-irritating and easily digestible. Among those foods that may be given are milk, eggs, rice, farina, sago, all forms of broth, especially chicken and mutton broths, sweetbreads, stewed chicken, baked potatoes, mashed potatoes, tea, cocoa, crackers, and toast.

DIET IN MALIGNANT GROWTH OF THE INTESTINE

The medical treatment in malignant growths of the intestine is only an adjunct to the surgical treatment always indicated, and consists solely in treating the symptoms as they arise. The diet should be highly nutritious and at the same time easily digestible; small quantities of food should be given at frequent intervals. Milk, broths, soft-boiled eggs, raw scraped beef, sweetbreads, baked and mashed potatoes, vegetables, such as carrots and peas, that have been finely divided and strained, stewed fruits, toast, and crackers are permissible.

DIET IN ACUTE INTESTINAL OBSTRUCTION

The treatment of acute intestinal obstruction, except when due to the impaction of a foreign body, when it may possibly be passed through the bowel, is purely surgical; as Treves has said: "There is one measure for acute intestinal obstruction, and that is by means of laparotomy." Previous to operation the following dietetic regulations should be carried out: The patient should be kept in bed, and in the acute attacks all food should be withheld. Thirst may be quenched by small bits of ice kept in the mouth or a few drops of hot water may be given at frequent intervals. If the disease extends over a period of several days, rectal alimentation or the administration of salt solutions must be resorted to.

DIET IN CHRONIC INTESTINAL OBSTRUCTION

In this condition the diet should chiefly be liquid or semi-solids. All indigestible food should be avoided, especially those forms that are apt to leave a large amount of residue in the bowel. The foods to be avoided are salads, heavy vegetables, and fruits. Milk broths, eggs, broiled meats, chicken and sweetbreads, boiled fish, rice, farina, toast, crackers, and butter are permissible. In advanced cases rectal feeding must be carried out.

DIET IN APPENDICITIS

The dietetic treatment in this disease must be governed by the symptoms, for surgical treatment is usually indicated. The patient should be put to bed, and under no condition be allowed to rise until recovery is complete. During the first days Sahli and Penzoldt recommend that all food be withheld; liquids, such as egg-albumin, weak tea, thin broth, barley- or rice-water, or milk diluted with lime-water, may be given in small quantities when deemed necessary. When the acute symptoms have subsided, this diet can be increased somewhat: the milk may be taken undiluted, and eggs may be added to the broth. When the pain and fever have disappeared entirely, gruels made of rice or barley, soft-boiled eggs, scraped beef, stewed chicken, toast, and crackers may be added to the list; still later mashed potatoes and vegetables—finely divided and strained—may be allowed, and finally, when the patient is well, the usual diet may be resumed.

Ochsner[1] advises the following plan of treatment in all cases of appendicitis in which operation is to be performed, believing that it reduces the mortality and changes the class of cases in which the mortality is greatest into another class in which the mortality is very small after operation:

"In every case of acute appendicitis all food by mouth and all cathartics are prohibited. In case the patient suffers from nausea or

[1] "The Mortality in Appendicitis," Medical News, May 2, 1903.

vomiting, gastric lavage is at once employed. In the milder cases the patient is permitted to rinse the mouth with cold water and to drink small sips of very hot water at short intervals. In the severer cases the patient is permitted to rinse the mouth with cold water, but is not permitted to drink either hot or cold water for the first few days until the acute attack has subsided, when the use of small sips of hot water is begun. If the nausea persists, gastric lavage is repeated once or twice at intervals of two to four hours, in order to remove any substance which had regurgitated into the stomach from the small intestine."

"The patient is supported by nutrient enemata consisting of an ounce of one of the concentrated predigested liquid foods in the market, dissolved in three ounces of warm normal salt solution introduced through a catheter which is inserted a distance of two and one-half to three inches. In case this gives rise to pain or irritation or nausea, it is interrupted for twelve to twenty-four hours at a time. In cases in which no water is given by mouth an enema of eight ounces of normal salt solution is given four to six times a day in addition to the nutrient enemata. In cases operated during the acute attack this treatment is continued for several days after the operation."

"After the patient has been free from pain and otherwise practically normal for four days he is first given from one to four ounces of weak beef-tea, preferably prepared from commercial beef extract, every two hours. In a few days one of the commercial predigested foods, dissolved in water, is substituted; still later, equal parts of milk and lime-water; then general liquids, then light diet; and finally, after the patient has fully recovered, full diet is given."

DIET IN MUCOMEMBRANOUS CATARRH OF THE INTESTINE

Various diets have been recommended in this disorder by different writers. Fleiner advises a simple non-irritating diet; others, as von Noorden, recommend a very coarse diet—one that will leave a large amount of residue in the intestine. The authors believe, with Einhorn, that a middle course is best, and therefore prescribe a nutritious mixed diet that is not too coarse; on such a diet the movements of the bowels become more nearly normal and the secretion of mucus is lessened. Von Noorden recommends a diet consisting "largely of Graham bread—250 grams a day in addition to a great variety of leguminous vegetables, including the husks; vegetables containing much cellulose; fruit with small seeds and thick skins, like currants, goose-berries, grapes, besides large quantities of fat, in particular of butter and bacon. The permanent effect of the diet is chiefly due to the amount of cellulose which it contains. This cellulose undergoes decomposition in the intestines and thus softens the movements." Of fifteen patients who were treated by von Noorden in this way,

seven were cured and seven improved. In conjunction with this diet mineral waters are used; of these, waters containing sodium chlorid are especially to be recommended, in particular those of Kissingen and of Wiesbaden. (For a discussion of the treatment of mucomembranous catarrh other than by the diet—*e. g.*, by oil enemata, irrigations of the bowels, etc.—the student is referred to the text-books on intestinal diseases.)

Ewald [1] advises the following diet in certain cases of membranous colitis:

"It is only rational that in these cases a mild, nourishing diet should be instituted, which through its nourishing qualities produces a laxative effect. This diet may be followed whenever constipation does not exist—a so-called lactovegetable or even constipating diet. The following diet scheme recommends itself for this purpose: Breakfast: Sweet milk, cocoa, oatmeal with cocoa, white or dark bread, with honey, jam, or fresh fruit. Dinner (preferably at midday): Vegetables or fruit, as apples, plums, blueberries, raspberries, cherries, a broth of vegetable soup, spinach, tomato, or beet soup, a milk soup, or curded milk, butter, and a liberal amount of fresh vegetables are desirable, or pea, rice, or lentil soup, stewed vegetables with dumpling, macaroni, puddings, blanc-mange with fruit-juices, etc.; salads, and eggs variously prepared, bread with butter, and a light cheese. Supper: A thick soup, made with barley, rice, tapioca, etc., baked potatoes, eggs, bread, butter, cheese, milk, etc.

"According to the needs of the patient the foregoing diet will be more or less carefully followed, and on certain days a small amount of meat may be allowed by way of variety.

"While this diet is directed especially against the local intestinal condition, still it serves well to support and improve the general nutrition, because of the high percentage of carbohydrates and fats, which is very important."

Zweig's Diet List for Mucomembranous Colitis.

Early morning:	Tea with milk, Graham bread, butter, honey.
Morning:	Glass of kefir (1 day old), rye bread, butter.
Noon:	No soup, meat or fish, vegetables, salad with egg and oil, dessert (fruits), grapes, dates, figs, oranges, Graham bread, 1 glass of cider.
Afternoon:	Vigor chocolate, Graham bread, butter, marmalade.
Evening:	Egg or egg and ham, meat (cold or warm), salad, dessert (fruit), Graham bread, butter, cheese, 1 glass of cider or white wine.
10 P. M.:	1 glass of kefir (1 day old).

DIETETIC TREATMENT OF NERVOUS AFFECTIONS OF THE INTESTINE

1. **Atony of the Large Intestine.**—The dietetic treatment of this disorder is identical to that indicated for habitual constipation, to be described further on.

[1] American Medicine, 1904, vol. vii., p. 261.

2. **Flatulence or Meteorism.**—This condition is characterized by an excessive accumulation of gas in the intestine. In the dietetic treatment, therefore, foods that tend to produce large quantities of gas, such as beer, cider, carbonated waters, fruit, cabbage, rye and Graham breads, and potatoes, should be avoided. The disorder is often of purely nervous origin, and when this is the case, unrestricted diet is to be recommended—one that will tone up the patient's system and thus cause the flatulence to disappear.

3. **Diet in Intestinal Neurasthenia.**—This disease resembles nervous dyspepsia. At times the most indigestible food is well borne, whereas the digestible forms create discomfort; in each case it is important that the diet be regulated according to the patient's digestive powers. Generally a liberal diet is indicated in these cases; in many instances a systematic rest cure is needed to bring about relief.

DIETETIC TREATMENT FOR HEMORRHOIDS

Since constipation is often a frequent cause and accompaniment of hemorrhoids it is important that this condition be corrected. As has been pointed out elsewhere, proper diet plays an important rôle in the prevention of chronic constipation. Patients afflicted with hemorrhoids should eat in moderation, but should avoid all excesses of food and drink. An abundance of outdoor exercise, consisting of walking and simple gymnastics, should be indulged in, violent gymnastics and horseback-riding should be avoided. A daily evacuation of the bowels should be secured. Patients with hemorrhoids should avoid alcoholic beverages, spiced foods, strong coffee and tea, cheese, cabbage, and beans. The foods most suited to this condition are potatoes, carrots, spinach, asparagus, and even salads, since they stimulate intestinal peristalsis and thus help to keep the stools soft. Stewed and raw fruits, including grapes, oranges, pears, and apples, are also beneficial. Water is the best beverage in this condition. The waters of Carlsbad, Kissingen, and Saratoga are most beneficial; they act best when taken at the springs.

Diet for Plethoric Patients with Hemorrhoids.—(After Wegele.)

Morning:	Milk or weak tea, Graham bread and butter with honey.
Forenoon:	Buttermilk.
Noon:	Soup, vegetables, compote (salad), and lean meat.
Afternoon:	Buttermilk or fruit and Graham bread.
Evening:	Soup, compote, cider.
	Mineral waters and grape-juice may be taken.

Diet for Nervous and Thin Patients with Hemorrhoids.—(After Wegele.)

Morning:	Milk with tea, butter, and milk.
Forenoon:	Buttermilk or kefir a day old.
Noon:	Soup, roast meat, light vegetables, compote.
Afternoon:	Kefir or tea and bread.
Evening:	Rice and milk, compote, and light white wine.

DIET IN CHRONIC DIARRHEA

The Authors' Diet-List for Moderate Cases of Chronic Diarrhea.

		Calories
8 A. M.:	200 gm. cocoa (cooked in water)	45
	2 soft-boiled eggs	160
	50 gm. zwieback	175
10 A. M.:	250 gm. broth with 1 egg	80
12 M.	250 gm. boiled chicken	212
	200 gm. mashed potatoes	245
	50 gm. zwieback	179
4 P. M.:	1 soft-boiled egg	80
	200 gm. cocoa (cooked in water)	45
	50 gm. zwieback	179
7 P. M.:	100 gm. rice cooked in bouillon	34
	200 gm. sweetbreads	180
	50 gm. wheat bread	130
9 P. M.:	100 gm. rare scraped beef	118
	50 gm. zwieback	175
	Total calories	2037

Cohnheim's Diarrhea Diet List is as follows:

7 A. M.:	Mineral water; hot, and taken in small doses of 75 to 150 c.c. The choice of the water depends upon the state of gastric secretions.
7.30 A. M.:	Eichel cocoa (2 teaspoonsful to a cup) in water, and toasted white bread and butter.
10 A. M.:	A cereal soup with butter, toast with butter, eggs, and scraped ham.
1 P. M.:	Broth with grits, noodles, macaroni, and white meat; in mild cases, vegetable purées, and 1 glass of blueberry wine.
4 P. M.:	Same as 7.30 A. M.
6 P. M.:	Mineral water.
7 to 8 P. M.:	Tea with red wine or blueberry wine, toast, butter, and cold white meat.
9 to 10 P. M.:	A cup of hot peppermint tea.

In mild cases, when the stool is of a pulpy consistency—or after improvement in severe cases—white bread, carrots, fillet, and baked fish may be allowed.

Strictly forbidden:

Cold drinks; any kind of coarse vegetables, like cabbage or potatoes; cheese, acids, cakes, coffee, all legumes (except when served in soups); goose, duck, salmon, animal fats, gravies, and raw fruits.

The dietetic treatment of diarrhea must vary according to the type of the disorder. In the nervous variety the patient should be instructed to restrain his bowel movements except at a certain hour in the morning. Under all conditions it is important to exclude from the diet all foods that have a tendency to stimulate the intestines. Coarse, indigestible foods, especially those containing a large percentage of cellulose, must be avoided; in this class are especially to be mentioned cabbage, pickles, salads, turnips, carrots, all cold drinks, carbonated waters, and beverages (including champagne and beer). Among the foods to be recommended are broths, tea, red wines, farina, rice, and barley gruels. Raw milk usually has a laxative effect, but

when boiled or diluted with lime-water or brandy it is constipating, although in a certain number of cases it must be entirely excluded as it increases the number of movements. In a number of cases of chronic diarrhea milk cures have been given with good results. The authors have succeeded in relieving cases of chronic diarrhea by systematic rest cures.

Diet-list for Chronic Diarrhea (Severe Cases).—(After Wegele.)

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	200 gm. acorn cocoa (boiled in water)	2.3	3.60	12.0	
	1 soft-boiled egg	6.0	5.00		
Forenoon:	250 gm. decoction of whortleberries from 80 gm. dried berries	0.6	1.30	4.7	
Noon:	250 gm. soup	5.5	4.00	7.5	
	1 egg in the soup	6.0	5.00		
	100 gm. scraped meat (lean)	20.7	1.50		
	50 gm. rice in bouillon	4.0	0.50	38.0	
Afternoon:	250 gm. whortleberry decoction	0.6	1.30	4.7	
Evening:	250 gm. maltoleguminose soup	6.5	0.25	15.5	
	with 1 egg	6.0	5.00		
	150 gm. minced chicken	15.0	9.00	12.0	
During the day:	75 gm. zwieback	9.0	1.50	42.5	
	200 gm. whortleberry wine	...	...	7.0	17.0
10 o'clock at night:	250 gm. barley mush (20:250)	5.0	4.00	25.0	
	Total	87.2	42.00	16.89	17.0
	Calories	360	390	690	120
	Entire number of calories				1560

Diet-list for Chronic Diarrhea (Less Severe Cases).—(After Wegele.)

		Protein.	Fat.	Carbohydrates.	Alcohol.
Morning:	200 gm. acorn cocoa	2.30	3.6	12.00	
	1 egg	6.00	5.0		
Forenoon:	240 gm. kefir (four days old)	8.20	5.7	2.00	3.3
Noon:	250 gm. soup	5.50	4.0	7.50	
	1 egg	6.00	5.0		
	150 gm. roasted chicken	28.00	10.0	1.80	
	250 gm. mashed potatoes	6.00	1.7	42.70	
2 o'clock:	250 gm. acorn cocoa	2.30	3.6	12.00	
6 o'clock:	250 gm. kefir	8.20	5.7	2.00	3.2
8 o'clock:	200 gm. soup	3.30	6.0	17.00	
	1 egg	6.00	5.0		
	100 gm. sweetbread	28.00	0.5		
10 o'clock:	250 gm. kefir	8.20	5.7	2.00	3.3
During the day:	75 gm. zwieback or toasted bread	9.00	1.5	42.50	
	20 gm. butter	0.15	16.6	0.12	
	250 gm. whortleberry wine	...	...	8.75	21.5
	Total	127.00	79.6	150.25	31.3
	Calories	520	740	615	210
	Entire number of calories				2085

DIETETIC TREATMENT IN HABITUAL CONSTIPATION

Aside from the general causes of chronic constipation, such as hereditary tendencies, irregular habits, sedentary occupations, dietetic

irregularities, and constitutional diseases, there are certain local causes of chronic constipation which must be borne in mind. There are those forms due to retarded intestinal peristalsis (atony of the intestines) and those due to spasmodic contractions of a portion of the intestine; we, therefore, recognize an atonic constipation and a spastic constipation. Both conditions may exist in the same individual.

In the dietetic treatment of habitual constipation, especially of the atonic type, it is essential that the food that is ingested should be such as will increase the intestinal movements. Those foods that leave a large bulk of fecal matter are useful for this purpose. Those that leave a small residue are most apt to produce chronic constipation. A diet consisting principally of eggs and milk with only a small quantity of vegetables and water is one that is constipating.

A glass of cold water taken before breakfast will often regulate the bowels; occasionally, according to Penzoldt, a pinch of salt added to the water will increase its efficacy; raw or cooked fruit, taken on an empty stomach morning or evening, occasionally gives good results. It is a well-known fact that the smoking of a cigar in the morning will often stimulate peristalsis. The patient should recognize the importance of having an evacuation of the bowels at the same time each day.

Chronic constipation is a frequent accompaniment of dyspeptic disorders, and may be relieved by appropriate treatment of the gastric disorder. It should not be forgotten that habitual constipation is frequently induced by the persistent use of cathartics, and the use of drugs should be avoided as much as possible in the treatment of this disorder. Sedentary habits are often the cause of constipation, and for this reason proper exercise should always be prescribed along with the dietetic treatment. The vegetables that are especially useful in the treatment of chronic constipation are lettuce, squash, carrots, oyster plant, turnips, spinach, peas, cauliflower, cabbage, asparagus, salads, onions, celery, and tomatoes which contain considerable cellulose and thus leave a large residue in the intestine. Potatoes are best taken baked and eaten with the skins. The cereals that stimulate the intestinal movements are oatmeal and cornmeal. Graham, rye, corn, whole wheat, and bran breads are also useful. Other foods classed as laxatives are honey, cider, molasses, and acid fruits, such as apples, pears, peaches, cherries, and oranges. On account of the acids and seeds they contain, berries are effective laxatives. Prunes, dates, and figs are also to be recommended. Fats are to be given freely, best in the form of butter, cream and olive oil. In some instances olive oil enemata retained over night are of the greatest help in the relief of this condition.

Habitual constipation is often due to the fact that water is taken in insufficient quantities; therefore, in the treatment of the disorder, an abundance of water must be prescribed. The foods to be avoided

Diet-list for Chronic Constipation.—(After Wegele.)

		Protein.	Fat.	Carbo-hydrates.	Alco-hol.
Morning:	200 gm. milk and coffee	3.20	4.40	3.20	
	30 gm. butter	0.21	24.50	0.15	
	30 gm. honey	0.35	0.03	17.00	
Forenoon:	300 gm. buttermilk	12.15	2.80	11.20	
Noon:	200 gm. bouillon	1.00	0.60	1.20	
	200 gm. mutton	23.20	50.50	0.70	
	300 gm. curly cabbage	4.20	14.40	21.60	
	200 gm. plums	0.80	...	11.60	
	300 gm. white wine or cider	...	...	9.00	24.7
Afternoon:	300 gm. buttermilk	12.15	2.80	11.20	
Evening:	150 gm. meat	28.20	11.00	0.10	
	30 gm. butter	0.21	24.50	0.15	
	300 gm. stewed apples	1.00	...	39.00	
	250 gm. Graham bread	22.50	2.50	125.00	
After evening meal:	750 gm. beer	42.60	6.50	4.70	28.8
	Total	145.77	194.50	245.80	53.5
	Calories	600	1800	1000	375
	Entire number of calories				3775

are tea, claret, cocoa, chocolate, rice, barley, and farina gruels, and huckleberries. In some cases milk acts as a laxative whereas in others it has the opposite effect. For this reason its effect should be tested in every case. Boiled milk usually constipates. Buttermilk is preferable to sweet milk as a laxative. Most cases of habitual constipation can be relieved or cured by the dietetic treatment here laid down; it is not within the province of this book to discuss the value of massage and electricity; suffice it to say that they are reliable adjuvants to the treatment of constipation.

In spastic constipation due to spasm of various portions of the bowel produced by overexcitability of the vegetative nervous system an entirely different plan of treatment must be instituted. These patients are ordinarily in an extremely nervous state, and physical and mental rest must be provided; raw fruits and vegetables containing much cellulose should be avoided and a soothing diet provided. Vegetables should be taken in the purée form, and fruits must always be given stewed. The easily digestible fats are useful in the form of olive oil, butter, and cream, soft cheeses are also helpful. Of value, in addition, are stewed fruit, oranges, grape-fruit, fruit juices, cider, buttermilk, acidophilus milk with lactose; honey and milk-sugar.

Aaron (Amer. Jour. Med. Sci., June, 1923, p. 816) advises the following diet in spastic constipation:

Breakfast: Orange or grape-fruit; porridge boiled in milk and strained, with sugar and plenty of cream and butter; weak or caffein-free coffee, or buttermilk; 2 ounces of cream; toast, butter, honey, jam or fruit sauce.

Luncheon: A cup of mucoid soup; sardines in oil, tender vegetables with cream sauce; light egg dishes with vegetable purée and mashed potatoes; jam, stewed fruit (strained), or honey; cream cheese; caffein-free coffee with cream; toast and butter, lemonade sweetened with two tablespoonfuls of levulose.

Dinner: A dish of mucoid soup prepared with butter; 3 ounces of fowl, veal, pigeon, sweetbread, brain, tongue, tender fillet of pork or tender roast beef, or fish boiled with a free amount of butter sauce; potato purée boiled in milk and mixed with butter, macaroni prepared in butter; plenty of purée of spinach, yellow turnips, young green peas, cauliflower, or artichokes, with butter, cream or the yolk of an egg; purée of stewed fruit, cream candies, or light farinaceous dishes with fruit or cream sauce.

Mucoid soups are made from oatmeal, rice, wheat starch, potato starch, and cornstarch. The grains are boiled four to six hours with water, passed through a fine sieve, and again brought to the boiling-point, butter or cream added, and suitably seasoned ready for use.

"Carbo-hydrate-Cellulose" Foods—(Krause-Garré).

100 Grams.	Water.	Proteid.	Fat.	Carbo-hydrates.	Cellulose.	Calories.
Cauliflower	90.89	2.5	.3	4.5	9.91	30
Spinach	88.5	2.49	.58	4.4	.93	33
Tomatoes	94.3	.9	.4	3.9	1.1	23
Celery	94.5	1.1	.1	3.3	.9	19
Potatoes (raw)	78.3	2.2	.1	18.4	1.	85
Peas (green)	9.5	24.6	1.	62.	.5	365
Beans (butter)	58.9	9.4	.6	29.1	4.	163
Turnips	89.6	1.3	.2	8.1	8.4	41
Parsnips	83.	1.6	.5	13.5	1.6	66
Cabbage	91.5	1.6	.3	5.6	2.	32
Apples (dried)	27.9	1.2	3.6	59.7	5.	250
Pears (dried)	29.4	2.07	.8	58.8	6.9	260
Prunes (dried)	29.3	2.25	2.75	62.	1.5	265
Grapes	78.2	.6	.8	16.3	3.6	70
Strawberries	87.6	1.07	.93	6.76	2.32	30
Figs	18.8	4.3	.3	74.2	7.3	325
Dates	15.4	2.1	2.8	78.4	5.5	356
Honey	19.61	1.2	.02	73.72		300
Cane Sugar	2.16	.35		96.23		400
Sago	12.8	.8		86.1		355
Tapioca	13.3	.6		85.		350
Macaroni	13.07	9.2	.3	76.8		350
Walnuts	4.7	16.4	62.9	7.9	6.2	685
Almonds	5.4	24.2	53.7	7.2	6.6	629
Oatmeal (Scotch)	12.37	10.41	5.23	57.8	11.2	300
Corn Meal	14.32	.4		85.		350
Zwieback	1.18	13.3	3.18	82.	.5	460
Rye Bread	42.2	6.1	.4	47.36	1.5	210
Graham Bread	34.	9.	1.	50.	4.	250

Potatoes are best taken baked and eaten with the skins.

The authors frequently prescribe the following diet in cases of chronic constipation:

		Calories.
6 A. M.:	40 gm. orange-juice	88
8 A. M.:	300 gm. milk with coffee	192
	2 soft-boiled eggs	160
	150 gm. Graham bread	375
	40 gm. butter	326
10 A. M.:	400 gm. cider	280
12 M.:	200 gm. broth, with 1 egg	84
	100 gm. steak	214
	100 gm. carrots	41
	100 gm. beans	193
	150 gm. Graham bread	375
	200 gm. stewed apples	106

		Calories.
4 P. M.:	400 gm. buttermilk	166
7 P. M.:	100 gm. scraped beef	118
	150 gm. Graham bread	375
	200 gm. stewed prunes	176
	300 gm. cider	210
9 P. M.:	40 gm. figs (or 400 gm. buttermilk)	46
		3525

Sutherland's Diet List for Chronic Constipation.

Half an hour before breakfast, 10 fluidounces of hot water with a small dose of Carlsbad salt dissolved in it, insufficient to produce an obvious aperient effect; or the juice of an orange made up to 10 ounces with cold water.

Breakfast: Coffee with milk and sugar, 10 ounces Graham or whole meal bread or toast, 3 ounces porridge with milk or cream (2 ounces of Scotch oatmeal), 1 egg (or fish or fat bacon); butter, 1 ounce; honey, ½ ounce (or treacle or home-made marmalade), 2 apples, baked or raw (or bananas, pears, or other fruit in season).

Lunch: Bread or toast as above, 3 ounces (or whole meal biscuits); fish, 2 ounces (or chicken or meat); French beans, 4 ounces (or onion, celery, cabbage, or Brussels sprouts); salads with oil, 2 ounces (lettuce, potato, beet); stewed fruit, with cream, 2 ounces (prunes, apple charlotte, or purée); butter, ½ ounce; lager beer, 10 ounces (or cider, Hock, Moselle, Berncastler).

5 P. M.: Coffee, milk, and sugar, 8 ounces; bread, toast, or whole meal biscuits, as above, 2 ounces.

Dinner: Clear soup, 6 ounces; otherwise as at lunch.

Bedtime: Water, plain or aërated, 10 ounces; whole meal biscuits.

A. Cohnheim's Diet in Atonic Constipation.

7 A. M.: One glass of cold water.

7.30 A. M.: Malt coffee or tea with milk, 1 teaspoonful of milk-sugar, whole wheat bread with butter, honey, or marmalade.

10 A. M.: Buttermilk two days' old, kefir, kumiss, or sour milk, whole wheat bread, butter, and ham.

12 M. to 1 P. M.: Vegetables, including cabbage, small amounts of meat, an abundance of sweet fruit juices, and 1 glass of cider sweetened with 1 tablespoonful of milk-sugar.

4 P. M.: Malt coffee or tea with milk, whole wheat bread and butter.

7 P. M.: ¼ liter of two days' old kefir or kumiss, Pilsener beer, bread and butter, eggs, or cold sliced meat.

9 to 10 P. M.: Fruit or honey cakes.

Strictly Forbidden:

Rice, gruel, sago, and cereal soups.

B. Conheim's Diet in Spastic Constipation.

7 A. M.: One glass of hot peppermint and valerian tea.

7.30 A. M.: Tea with cream and a tablespoonful of milk-sugar, and fine white bread with butter and raspberry jelly.

10 A. M.: Kumiss or kefir two days' old, white bread and butter, and 1 egg.

12 to 1 P. M.: One small plate of soup, tender vegetables cooked in butter. meat, stewed fruits, and 1 glass of raspberry lemonade.

4 P. M.: Same as 7.30 A. M.

6 P. M.: ¼ liter of kefir or kumiss.

7 to 8 P. M.: Tea with cream, 1 tablespoonful of milk-sugar, white bread, butter, and cold meat.

9 to 10 P. M.: Purée of fruit.

Forbidden:

Cabbage, coarse bread, goose, duck, and all raw fruits, except sweet apples, oranges, and grapes.

DIET IN CHRONIC INTESTINAL STASIS

Intestinal stasis may be defined as that condition in which there is a retention of the intestinal contents for a period longer than normal associated with a toxemia of a more or less severe type. While the intestinal canal is so altered as to retain material that should be excreted and there is more absorption than can be taken care of by the body, the secretions and poisons are forced into the intestinal tissues and, in consequence, the symptoms of intestinal stasis are produced. Intestinal stasis is usually associated with chronic constipation. The main factors which play a part in the production of this affection acting singly or collectively may be grouped as follows:

1. Bacterial invasion. The type of bacteria propagating in the intestinal canal depends largely upon the character of the diet; a diet rich in animal protein producing an intestinal flora dominated by proteolytic putrefactive organisms while under a diet rich in carbohydrates, the predominating organisms are fermentative or aciduric. As a result of the proteolytic action toxic substances are produced which are assumed to be the cause of the various forms of intestinal toxemias.

2. Disturbances in the motility of the bowels revealed by means of the *x*-ray. These factors are malposition of various portions of the intestinal tract; spasticity of the bowel often associated with adhesions; cecal dilatation, often associated with chronic appendicitis; ileocecal incompetency; various kinks or membranes and adhesions in various portions of the bowel.

3. Disturbances of the innervation of the intestine and of the endocrine system.

4. Disturbances of the intestinal secretions with the production of various lesions in the bowels.

The treatment of chronic intestinal stasis is largely that of chronic constipation, together with the treatment of the accompanying nervous symptoms. Einhorn calls attention to the fact that patients should be impressed that no harm can ensue even if the bowels do not move for several days at a time, and should be instructed to go to stool at the same hour each day, and not pay further attention to the bowel movements until the following day.

The diet to be prescribed in this condition is practically that which has already been described under the head of Chronic Constipation. Water should be taken liberally and vegetables, fruits, and salads given plentifully. Paraffine oil is most helpful in many cases and agar often assists greatly in relieving the constipation. Olive oil by mouth or by enema to be retained overnight is often of the greatest benefit. High colonic irrigations and duodenal lavage with Ringer's solution or with saline solutions frequently afford great relief. In many instances an initial radical change should be made in the diet in an attempt to change the bacterial flora. Physical measures,

including massage, electricity, and the wearing of an abdominal support, are to be recommended in some cases. In a very small proportion of cases operation may be indicated.

The diet should be of such a character as to leave considerable residue, bland food being replaced by coarse and fibrous food. Eggs and meats should be greatly restricted. The breakfast should consist of the coarser cereals, oatmeal, cornmeal bread, graham bread, bran bread, or whole wheat bread, together with fruit. The noon meal should especially contain such vegetables as cabbage, peas, beans or cauliflower, with graham or bran bread, and the evening meal should consist largely of similar coarse vegetables, together with an egg or a small amount of meat, graham bread, and a salad, and stewed fruit. If the patient is undernourished a rest cure with massage and forced feeding will often produce splendid results. If the patient is overnourished, a reduction cure is to be recommended. In many instances buttermilk or, better still, acidophilus milk, to which an adequate quantity of lactose has been added, are valuable additions.

Attention has already been directed to the experiments of Rettger and Cheplin, who demonstrated that by feeding with cultures of the Bacillus acidophilus the intestinal flora may be so altered as to convert it from a putrefactive proteolytic to a fermentative or aciduric type. A similar change may be brought about by means of feeding adequate quantities of lactose with a rapid increase in the Bacillus acidophilus forms, and finally with a reduction to a very marked extent of the putrefactive bacteria of the bowel. This change may necessitate, however, amounts from 300 to 450 grains of lactose per day, a quantity which could scarcely be continued over any great period of time. Rettger and Cheplin have demonstrated that by means of from 500 to 1500 c.c. of an acidophilus culture, the intestinal flora is converted from the putrefactive type to one consisting largely of the Bacillus acidophilus forms, which may be continued indefinitely by this method of feeding. Similar results may be brought about by a combination of lactose and the acidophilus culture, each in lesser quantities. While sweets should, as a rule, be avoided on account of their tendency to induce flatulence, honey does not produce this effect and, therefore, is especially useful on account of its laxative effect.

DIET IN PERITONITIS

Acute Peritonitis.—The diet in acute peritonitis is purely of secondary importance, and requires consideration only until operative procedure can be undertaken. The starvation treatment or the so-called Ochsner treatment may be employed up to this time. The patient is placed in the Fowler or sitting position, so that the peritoneal exudates gravitate toward the pelvis. Neither food nor drink

should be given by mouth. An ice-bag is placed upon the abdomen. The stomach is washed out frequently to prevent vomiting, and continuous enteroclysis, according to the method of Murphy, should be practised. If operation is not undertaken and vomiting has ceased, fluids may be given in a few days. Foods that may be prescribed are milk and lime-water, diluted broths, and egg-albumin with or without brandy or sherry; only very small quantities should be taken at a time, but at frequent intervals; gradually plain milk, broth, and gruels may be added to the list; solid food should not be allowed for several weeks. When stimulants are required, they should be given in the form of whisky, brandy, or champagne.

Diet in Chronic Peritonitis.—The diet in chronic peritonitis should consist of boiled meats, eggs, milk, stale bread, toast, or crackers, and vegetables, only, however, in the form of purées; carbohydrates should be eaten sparingly, on account of their tendency to ferment. Food should be eaten in small quantities at regular but frequent intervals.

DIET IN LIVER DISEASES

To prevent needless repetition, certain general dietetic rules will here be given for the management of liver diseases in general. The theoretic discussions bearing on this subject have become so numerous as to render even brief consideration of them impossible. For this reason the subject will be dealt with here only from a practical standpoint.

The group of symptoms generally classed as "biliousness" are usually the result of overeating, and the so-called "bilious attack" is nothing more than a cry of the liver for relief. Many individuals when they become constipated suffer from these attacks. These two facts furnish the indications for treatment: rest and open bowels. In the acute attacks all that is necessary is a restricted diet for several days, together with the administration of calomel, followed by a saline. The object of treatment in all diseases of the liver should be to give the organ as little work to do as possible. It should not, however, be put at absolute rest, and it is probably not possible to accomplish this end on account of its influence on general metabolism. In general, a simple, well-mixed diet containing protein, fat, and carbohydrates is indicated. In certain diseases in which the function of the liver is manifestly impaired, fat and carbohydrates must be restricted or even omitted entirely for a few days. Both, if not promptly disposed of, are apt to undergo changes in the intestinal canal.

Certain articles of diet are known, while others are believed, to be injurious in diseased conditions of the liver. Overeating is injurious, first, on account of the overwork it necessitates; and, secondly, be-

cause the superfluous food is apt to undergo putrefaction. The resulting bacterial products are believed to act on the liver in much the same manner as does alcohol. The excessive use of alcohol produces marked changes in the liver in certain individuals. This has been proved by experiments on animals. In a series of experiments performed by the authors in the Pathologic Laboratory of the Johns Hopkins Hospital, Baltimore, actual cirrhotic changes in the liver were induced by the administration of alcohol.[1] Some persons may take alcohol continuously with impunity. If taken in excessive quantities, however, over sufficiently prolonged periods, it probably invariably produces chronic tissue changes. When a certain amount is taken, it seems to be burnt up in the body as food; when this limit is passed, it becomes a poison. In certain fevers enormous quantities may often be consumed with great benefit. Just what amount may be taken with safety by any one individual is not known, and is dependent in large degree on idiosyncrasy. It has been estimated that two ounces of alcohol on the average may be consumed as a food in twenty-four hours. The form and the amount of concentration of the alcohol are important factors in considering the effect of alcohol on the liver. Whisky, brandy, and similar spirituous liquors, taken in a concentrated form, undoubtedly produce more marked tissue changes in the liver than light wines or beer.

In all liver diseases alcohol should be avoided unless specially indicated as a tonic or stimulant. In any case it should be given well diluted. A well-matured pure whisky well diluted with water is to be preferred, and this only in the smallest possible amount.

Certain foods have been regarded as "stimulating" or "irritating" to the liver. Among these are peppers of various kinds, spices, mustards, concentrated meat extracts and meat broths, and the substances formed in roasted and baked meats. To be proscribed are peppers, radishes, horseradish, onions, watercress, and celery. Salt in too large quantities is also to be condemned. Strong coffee and tea are harmful, but weak tea seems to be well borne in many cases.

In severe diseases of the liver the diet must usually be restricted to milk, diluted or peptonized, gruels, albumin-water, kumiss, buttermilk, and bland broths, such as oyster broth. Orange-juice as well as lemonade may generally be allowed.

In the milder disease and during convalescence the diet need not be so rigid, and lean meat, curd, junket, bread, toast, zwieback, fresh fruit, or fruit stewed with little or no sugar, may be allowed. In the chronic cases and lighter forms the following articles may help to make up the dietary. Milk, variously diluted and prepared, buttermilk, curd, kumiss, custard, junket, eggs, lean meat, if beef or mutton, preferably rare, sweetbreads, chicken, squab, liver, the soft parts of

[1] See Welch, The Physiologic Aspects of the Liquor Question.

oysters and the more digestible forms of fish. Fresh green vegetables and green salads without oil are permissible. Small quantities of well-baked or boiled mealy potato may be allowed once a day, for many persons do not relish a meal that does not contain potato in some form. The starchy foods should be partaken of somewhat sparingly bread, toast, zwieback, pulled bread, and biscuits (crackers) may be permitted. Small quantities of cereal foods may be taken—rice, sago, and tapioca, when sufficiently well-cooked, may be allowed. Fresh fruit is a valuable adjunct to the diet. Oranges, grape-fruit, ripe peaches or pears, grapes, strawberries, ripe plums of the most tender varieties may all be taken. Stewed fruits only slightly sweetened and baked apples may be allowed with advantage. If there is constipation, stewed prunes are useful. Lemonade may be taken as a beverage.

Mineral waters may be drunk freely if dropsy is not present, and are best taken on rising and between meals. Hot water is a valuable substitute for the mineral waters. It is especially useful in allaying thirst when there is dropsy.

The food should be taken slowly, well masticated, and never in too large quantities. If necessary, more milk may be given, so as to make large amounts of other food unnecessary. The patient should lie down directly before and after meals. In no case should the patient eat immediately after taking active exercise.

In certain chronic conditions, such as hyperemia, fatty degeneration, and chronic hepatitis, exercise is to be taken at proper times.

In summer and in warm climates more vegetables are to be allowed and less meat. When the putrefaction is caused by torpidity of the liver, it may sometimes be prevented by increasing the amount of vegetables and by the use of laxatives.

CATARRHAL JAUNDICE

During the acute stage, so long as there is any tendency to vomit or while dyspepsia is marked, the patient should be kept quiet in bed. The diet should be very light and fluid. Fat is especially to be avoided, as are, of course, all foods that are either chemically or mechanically irritating.

Milk, which may either be skimmed or diluted with lime-water or mineral waters or peptonized, is probably the most useful article of diet. On account of the fat which whole milk contains it is, however, open to certain theoretic objections. In practice, nevertheless, it is generally well borne. Buttermilk or kumiss may also be used, as may beef-juice, oyster-broth, clam bouillon, albumin-water, and well-cooked and strained barley gruel. If the stomach is irritable, food should be given in small quantities and at regular intervals. As the stomach becomes tolerant and the appetite returns, bread, zwieback, toast, lean

meat, such as the breast of chicken, sweetbreads, and tender steak or chops may be administered. Soups thickened with barley or flour may be given, and the lighter forms of fish may also be allowed. Fruit, well cooked and without too much sugar, may be added as convalescence progresses. All coarse forms of vegetables must be avoided, but spinach, asparagus tips, and cauliflower tops may be given. Well-cooked mashed potatoes may be allowed in moderate quantities. The meals should be small and, if necessary, may be given frequently. During convalesence, when the appetite returns in full force, the patient should be cautioned against overeating. For several months the diet should be guarded and all irritating and coarse articles of food avoided.

Coffee and tea should be forbidden during the acute stage, but during convalescence they may be allowed, but should be given neither too strong nor in too great quantity. Alcohol is best avoided. Fats, such as butter and cream, should be withheld longest in the return to a full diet. If an excess of starch or of sugar is taken, disturbances are certain to follow; if fats are given in too great abundance or too early, putrefactive changes are apt to occur.

Mineral water may be drunk freely during the course of the disease, and the bowels should be kept open. Carlsbad and Vichy are especially to be recommended, but other waters may be used. Plain carbonated water is useful as a beverage.

Catarrhal Jaundice in Children.—The disease is rare in children under two years of age. The same general principles of diet may be adhered to as when the disease occurs in adults. Fat, starches, and sugar should be reduced in quantity, and rare meat, fruit, and milk more plentifully supplied. If vomiting occurs, milk diluted with lime-water or a carbonated water, or peptonized milk may be used. If the gastric symptoms are severe, the diet should be the same as that for acute gastric indigestion. Calomel, the salines, and mineral waters should be prescribed to keep the bowels open.

CONGESTION OF THE LIVER

Acute Congestion.—The treatment depends largely on the cause. When the congestion occurs in the course of acute diseases, the diet is practically the same as that of the associated disease. When there is pain, rest is essential. If the patient's condition warrants, the diet should be largely restricted. Skimmed milk or milk diluted with alkaline mineral waters is the best diet. Very little food for a day or two and then increase gradually. Milk, soups, lean meat fruit, cooked fruit, soft green vegetables and bread or toast should form the bulk of the dietary. All irritating foods, coffee, strong tea, and alcohol are to be avoided. Salines are indicated in most cases.

Passive Congestion of the Liver.—The diet should be restricted

and the same general principles observed as directed in liver disease in general.

ACUTE YELLOW ATROPHY

The diet should be restricted; usually only liquids can be given, such as milk, diluted as in catarrhal jaundice, albumin-water, etc. In general the management resembles that of an acute fever.

ABSCESS OF THE LIVER

In the early stages the patient should be put at rest and receive a very light diet of milk, gruels, and the like. After operation the diet may be as nutritious as possible, bearing in mind the general principles of diet in liver diseases.

FATTY LIVER

The diet will depend upon the exciting cause. When the fatty liver is the result of general obesity, the treatment should be along the lines indicated for that condition. When it is due to tuberculosis or to other chronic infections, the diet should be arranged accordingly. In the severe cachexias that mark incurable diseases little can be done in the way of diet.

In general the food should be easily digestible; milk, lean meat, and eggs are mainly to be relied on. Predigested milk and meats may be of value, but fats and oils should be avoided.

AMYLOID LIVER

This is usually caused by long-standing suppuration. The food should be as easily digestible as it is possible to make it. At the same time the largest amount of protein material consistent with the patient's digestive powers, should be given.

SYPHILIS OF THE LIVER

The diet should be arranged according to the general principles laid down for liver diseases in general.

DIET IN GALL-STONE DISEASE

Cholelithiasis is a subject of ever-increasing interest. It is estimated that about 10 per cent. of the population of Germany have gall-stones. Kehr states that only about 5 per cent. of these ever give rise to serious disturbances. Numerous theories have been advanced regarding the cause of the formation of gall-stones. Errors in diet and the various food elements have been considered causative, and have led to the establishment of various dietaries. Most observers are, however, inclined to consider the prophylactic measures about to be described of value. (For an exhaustive discussion of this sub-

ject the student is referred to the article by Quincke and Hoppe-Seyler in Nothnagel's Encyclopedia of Medicine, which has been ably edited by the late Dr. Frederick A. Packard.)

The two factors that in all probability exert the most influence on the formation of gall-stones are the stasis of bile and the inflammation of the bile-passages and gall-bladder. To this end anything that will increase the flow of bile should be encouraged, and anything that retards it, avoided. To obviate the latter all food that is liable to cause indigestion, with the attendant dangers of putrefactive changes setting up inflammatory processes, should be carefully avoided.

The patient should lead an active, if possible an out-of-door, life and physical exercise should be a part of the daily routine. Horse-back-riding for those who are in condition and who can afford it is excellent. Walking, fencing, golf, tennis, and swimming are helpful, and where these are not enjoyed, systematic gymnastic exercises should be prescribed. Exercise, if the motions are violent enough, acts directly by forcing the bile from the liver and gall-bladder, and indirectly by increasing the movements of the intestines.

The clothing should at all times be comfortably loose. Women especially should be cautioned in regard to this point. The corsets should fit loosely and be suspended from the shoulders, so as to take the pressure from the waist. After meals the clothing should be loosened, so as to relieve the abdominal organs from pressure.

Constipation should studiously be avoided. The diet should be arranged with this object in mind, and the use of laxative salines is to be recommended where their use is necessary. Epsom salts and sulphate of soda are of especial value in this connection. If desired, the saline mineral waters may be substituted, or, for those who can afford it, occasional visits may be made to various mineral springs.

The meals should be taken at regular intervals not too widely separated. Prolonged fasting should never be permitted, for eating increases the flow of bile while fasting causes the bile to be stored up in the gall-bladder. Some years ago Frerichs contended that in cholelithiasis the meals should come close together. Care must, however, be exercised to see that the food is being thoroughly digested and moved along the intestinal tract normally. Kehr advises a supper to be taken late at night. Other authors have advocated waking the patient in the middle of the night to administer nourishment. This last would seem to be entirely unnecessary. Naunyn insists on the importance of a sufficiently large breakfast and, indeed, a large meal after any fast. The average American breakfast is, however, sufficiently large in almost all instances. Care should be taken not to err in the opposite direction by giving more food than can be digested.

In the choice of food there are certain things to be avoided. In

the first place, all food that is not entirely above suspicion or that is liable to set up putrefactive changes must be interdicted. In this category are to be placed stale fruits, stale fish and shell-fish, over-ripe cheese, and the like.

Fat should, as a rule, be reduced to a minimum, for there is considerable clinical evidence to show that the abundance of fat is injurious in gall-stone disease, as well as in other disorders of the liver. Whether the fat acts in any other way than in producing bowel disturbances is a question that has not yet been decided. Herter has recently pointed out that dogs fed for months on a diet rich in fat and low in proteins showed concretions in their gall-bladders. Fat, should, however, not be eliminated from the dietary altogether.

Excesses in carbohydrates, either in starches or in sugar, should be carefully avoided. Anything that will irritate the liver should be prohibited, as should all rich and complicated dishes. Any food that is apt to cause indigestion is to be regarded as unsuitable for the patient with gall-stones.

Protein, carbohydrates, and fat should go to make up the dietary, which should consist of simple food, plainly prepared, with care, however, to avoid a monotonous diet. Meat should not be eaten too freely, and only the leaner varieties should be used. Milk and eggs are allowable, but if the milk is extremely rich, a portion of the cream should be removed. Some authors forbid the yolk of eggs as containing too much fat.

The green vegetables and fresh fruits are suitable articles of food and may be partaken of freely. Cereals and potatoes may be used in moderation, but not where there is ''starch indigestion.'' Turnips, beets, and the like may be partaken of sparingly. While various authors forbid the use of some of these, it is probably not the choice, but the quantity, that should be considered in this connection.

Bread, rolls, and the like may be eaten as desired, bearing in mind that in ''starch indigestion'' the amount should be limited. Pastry and any but the plainest cakes should be omitted from the diet. Harley made the statement that he believed that starch puddings and fat bacon caused more gall-stones in England than all other foods put together. Alcohol should be avoided, but coffee and tea may be allowed in moderation. The drinking of hot water on rising and at bedtime has been advised, as well as the various mineral waters mentioned in connection with constipation.

Coëxisting diseases are believed to exert some influence on the formation of gall-stones, and when gout, chronic rheumatism, diabetes, obesity, or dyspepsia exists, the diet should be regulated accordingly.

Rothchild and Rosenthal have shown that in the majority of cases of cholelithiasis a hypercholesterinemia is present. In some of these

patients there seems to be a cholesterin diathesis just as there is a uric acid retention in individuals affected with a gouty diathesis. The recognition of such a condition is important since secondary operations in gall-bladder affections might be avoided by proper dietetic management. They point out that since the cholesterin content of the blood is dependent upon the cholesterin content of the food, by diminishing the latter, one can correspondingly diminish the former and by rendering the absorption of cholesterin as difficult as possible the cholesterin content of the blood will be lowered. This can be done by placing the patient upon a fat-free diet, which excludes lipoids to a large extent and renders difficult the esterization of the free cholesterin in the food. All foods rich in fats are excluded. Butter and its substitutes, olive oil, eggs, cream, meat and fish. Beans and peas are also excluded on account of their containing phylocholesterin. On a strict diet of this kind, practically only vegetables are allowed, any kind may be taken together with cereals and sugar. Skimmed milk or fat free buttermilk may also be used.

The majority of patients will not adhere to this diet for any long period, as a rule, so that it has been suggested to have fast and feast day periods. For three or four days a week the patient lives on a strict fat-free diet. This is the so-called fasting period. For the next three or four days, dependent on the grade of hypercholesterinemia, a more liberal diet is permitted, the so-called feast days, on which the patient is allowed well cooked lean meats and fish, excluding salmon, shad and blue fish, the fat content of which is high. Oleomargarine is allowed instead of butter. By means of these dietetic restrictions the authors referred to have been able to reduce the hypercholesterinimia and apparently have solved at least one of the important etiologic factors of chronic cholelithiasis.

CIRRHOSIS OF THE LIVER

Hypertrophic Cirrhosis (Hanot's Disease).—Hanot, in his monograph on the disease that bears his name, dismisses the subject of the diet almost in a word. He recommends a milk diet for weeks at a time where it is well borne. Where a more extensive diet is indicated the same lines may be followed as were laid down for cirrhosis in general.

Cirrhosis.—So far as diet is concerned, all forms of cirrhosis may be treated in much the same general way. Since no two cases are exactly alike, it must never be forgotten that each case requires individual consideration. The heart, the kidneys, or the alimentary canal may be involved, and ascites may be present. The existence of these complications materially affects the management of the case.

Certain cases of cirrhosis are due to the long-continued use of alcohol, highly seasoned food in excessive quantities, and, probably,

to chronic intestinal fermentations. Certain metallic poisons may also cause it.

All individuals who are predisposed to cirrhosis,—those who come from families where liver disease or other forms of cirrhotic disease are frequent,—should be cautioned in regard to the diet and the use of alcohol. Those large eaters and drinkers or those who suffer from indigestion, discomfort, or even pain over the region of the liver, should be put on a simple diet, composed largely of milk; the bowels should be kept open by the use of saline mineral waters; alcohol should be withheld altogether or reduced to the smallest possible amount. All rich foods and those mentioned as irritating the liver should be avoided. If alcohol is given up and the patient lives correctly, much can often be done in the early stages to avert, or at least to postpone, the disastrous consequences.

Cases without Ascites.—When the disease has been diagnosed, and if ascites is not present, the patient may be put on a milk diet or a diet composed largely of milk and milk foods. Kumiss and buttermilk are very useful. Egg-albumin and cereal gruels may also be used. Under a simple diet of this kind the gastric symptoms may abate or even disappear. The saline mineral waters and potassium iodid are valuable adjuncts in the treatment. The consideration of other drugs useful in this condition does not come within the scope of this work. When recovery has set in a simple diet, composed of milk, the lean, easily digestible meats, preferably broiled steak and chops, chicken, and the like, eggs, bread, green vegetables, and fruits, potatoes, and cereals, if desired, are allowable. The meals should be small and taken at regular intervals. Hot water or the saline waters may be taken on rising and an hour or so before eating. The general principles for diseased conditions of the liver already described must be followed.

Cases with Ascites.—The selection of a diet for these cases is frequently a matter of considerable difficulty. Rest, salines, and a restricted, somewhat dry diet often gives great relief. When the kidneys are in reasonably good condition, a dry diet, such as in recommended for senile heart, may be tried. Hot water may be sipped on rising and at various intervals during the day, and helps to flush out the waste-products of metabolism. Should kidney symptoms arise and the quantity of urine be greatly lessened, it is better to increase the allowance of fluid.

If kidney diseases are present, it is not wise to attempt to relieve the ascites by withholding fluids. When kidney complications arises, French writers and others recommend a diet composed largely of milk, on the ground that it is a good diuretic, excreting not only the fluid itself, but a portion of the fluid held in the body as well. (See also Karell Diet.)

DIET IN DISEASES OF THE PANCREAS

Diseases of the Pancreas.—These have not been studied much with reference to diet except where the internal secretion is interfered with—viz., diabetes. Tumors and cysts which interfere with the pancreatic secretion are to be dieted as in chronic pancreatitis.

Acute Pancreatitis.—Small amounts of food may be given, if retained. Orange juice, skimmed milk, diluted or pancreatized, dried milk, malted milk, gruels, and later, as the function of the pancreas returns, the diet must be guided by the functional activities of the gland as in chronic pancreatitis.

Chronic Pancreatitis.—The diet is of the greatest importance and must be chosen with reference to which part of the pancreatic secretion is interfered with. If all are deficient, a diet low in fat, with sufficient of the more easily digested proteins to maintain life, and well-prepared farinaceous foods with fruit juices, and small amounts of green vegetables must be given. Often the food may be predigested to advantage, *i. e.,* peptonized or pancreatized milk; cereals predigested with liquid takadiastase.

When amylopsin is deficient a fermentative condition arises with large, white, foul-smelling stools mixed with gas bubbles. Starch-free diets, as described elsewhere in this volume, especially under Celiac Disease, may be used.

When trypogen is deficient there is marked intestinal putrefaction, indicanuria, and undigested muscle-fibers may be seen in the stools if meat has been given. The proteins should be reduced to a minimum, may be partly predigested, particularly if they are drawn largely from milk, as milk, skimmed milk, buttermilk, clabber, curd, cream cheese, and the like. Fruits and fruit juices, green and starchy vegetables, and bread stuffs and cereals may be given, but always well within the digestive capacity.

If steapsin is deficient, characteristic stools containing fat in masses, semisolid or as greasy fluid, a fat-free diet of easily digested proteins, as just mentioned above, with the addition of lean meats and fruits, cereals, and green vegetables must be arranged. (See Fat-free Diet.)

DIET IN DISEASES OF THE RESPIRATORY ORGANS

DIET IN PLEURISY

The diet suitable in the treatment of pleurisy with effusion has been the subject of many experiments. The two principal methods advocated are: (1) To give the patient as dry a diet as is possible, in the hope that, by restricting the amount of fluid supplied to the blood, the absorption of the fluid effusion will be hastened. It has also been recommended that ordinary table salt be taken in large

quantities, on the principal that, owing to the increased density of the blood, a more rapid absorption will take place. Schroth's "dry cure" has also been recommended. (2) The second plan, advocated especially by certain French writers, is to place the patient on an exclusive milk diet, in much the same manner as described in the Milk Cure. This is said to increase the excretion of urine, and also to cause the absorption of the effusion. The return to a general diet should be gradual. Practically either plan may be followed, according to the condition of the patient. If there is fever or complicating kidney or heart disease, the milk diet is to be preferred. If there are no complicating diseases and no fever, ordinary diet with a lessened amount of fluids should be prescribed. No soups, but little coffee, tea, or other beverages, and as small an amount of water as the patient can comfortably get along on should be allowed. Large effusions are better removed by aspiration than by diet.

DIET IN EMPYEMA

The dietetic management of empyema is the same as that of any septic condition. If there is fever, the diet should be that advised in the treatment of fevers in general. If there is little or no fever, the diet should be similar to that recommended in the early stages of tuberculosis. Gilman Thompson advises a diet containing as much fatty food as the patient can take as best meeting the demands made on the system by the excretion of such large quantities of pus. Foods that cause the generation of gas in the intestine should be avoided. This usually arises from an excess of carbohydrate food, but may also be caused by the ingestion of large quantities of fat. If there is marked tympanites, the embarrassment of the respiration is increased.

LARYNGISMUS STRIDULUS

Attacks may be brought on by overfeeding, by the ingestion of indigestible articles of food, and by constipation. The diet should be carefully supervised, and the same general indications met as in rachitis.

LARYNGITIS

In chronic inflammations, especially tuberculous laryngitis, certain dietetic measures may be employed that will give considerable relief to the patient. Hard and dry toasts and the like should not be eaten, as they give rise to pain on being swallowed. For the same reason highly seasoned foods are to be avoided. Only semisolid or liquid food should be eaten. Milk, custards, junket, soups and gruels, raw oysters, raw eggs, scraped beef, and the like are the most suitable articles of diet. To allay the irritation in the larynx Loomis advises that a raw egg be sucked from the shell. If there is much pain on swallowing codein or cocain solutions should be applied locally be-

fore feeding. A tablet containing $\frac{1}{24}$ of a grain of cocain may be placed on the back of the tongue and allowed to dissolve. This is generally effective, and has the advantage that the patient can use it himself.

Difficulty in swallowing may sometimes be overcome by the following two methods: By allowing the patient to lie flat on a lounge with his face over the edge. Food is to be sucked through a tube from a vessel placed immediately below. The second method consists in directing the patient to lean forward while eating. Sajous (quoted from Thompson) says that this latter posture causes the food to pass down along the pyriform sinuses, thus avoiding the upper portion of the larynx, contact with which causes the severe pain experienced during deglutition in advanced cases of laryngitis.

DIET IN ASTHMA

Asthma usually occurs in markedly neurotic individuals, who are apt to exhibit other neuroses, such as gastric and intestinal disorders. Various forms of food—*e. g.*, the starches and sugars—have been said either to cause or to predispose the individual to asthma.

As a matter of fact, many attacks of asthma are brought on by indigestion, this usually being directly traceable to some error in diet. So patent is this fact that certain cases are classed as ''peptic'' or ''gastric'' asthma.

Any food that causes indigestion should be avoided. Patients usually learn by experience what they can and what they can not digest. Some curious idiosyncrasies occur: For example, in one patient rice may cause indigestion—even when the most minute quantities are introduced into his food without his knowledge an attack of indigestion and subsequently of asthma may supervene. These idiosyncrasies exist, of course, in others besides asthmatics, and many remarkable stories, some well-authenticated, are told in this connection. (See Food Allergy.)

The asthmatic should live a quiet, well-regulated life. If there is any gastric or intestinal derangement, it should carefully be treated. The diet should be light and nutritious, and should be taken at regular intervals. The meals should be of a size to be easily digested. Violent exercise of all kinds should be prohibited.

The foods most suitable for the asthmatic are the lighter kinds of fish and meat—the white meat of chicken, roast-beef, beef-steak, chops, and mutton. The most easily digested vegetables, such as spinach, asparagus-tips, cauliflower tops, baked potatoes, and the like, may be taken. Cereals and whole-wheat bread may be used in moderation. In most cases, plain desserts may be allowed. Pork, cheese, heavy cakes, pastry, and all similar indigestible articles of diet, should be avoided. Fats, sugars, and starches should be taken in moderation,

if at all. Experience will generally prove the best guide as to what is suitable. Foods that are apt to cause flatulence are best avoided. A diet like that advised in high blood pressure often affords relief.

Dinner should be taken in the middle of the day, and the supper should be light. Eating at night should be discountenanced. Tea and coffee, if they do not cause gastric disturbance, may be taken in moderation. Strong coffee has been credited with warding off attacks; for this purpose two or three cups of strong coffee are to be taken just before a threatened attack.

In the weaker patients alcohol may be allowed, best given in the form of good matured whisky. Beer and ales should be avoided by most patients. Every case of asthma should be studied carefully in order to learn what food is and what is not harmful. All asthmatics probably give up many articles of diet that are in reality indicated in their condition.

DIET IN EMPHYSEMA

Patients with emphysema should seek to prevent flatulence and constipation. All indigestible foods should be avoided, and the diet should be along the same lines as indicated in asthma. Starches and sugar should be taken only in moderate quantities, as otherwise they may ferment and give rise to flatulence; the dyspnea that it is apt to bring on may be a source of great discomfort. In the later stages milk is found to agree better than any other food. Cod-liver oil, when it agrees with the patient, is to be recommended. The meals should be small enough to be easily digested, and the heaviest meal should be taken in the middle of the day.

DIET IN CHRONIC BRONCHITIS

The dietetic management of chronic bronchitis is similar to that advised in the early stages of tuberculosis. In the dryer forms demulcent drinks are useful, and hot flax-seed tea, sweetened with sugar and flavored with lemon-juice, should be taken in sufficiently large quantities and is particularly effective. Hot drinks of various kinds may be used, and are especially useful in temporarily relieving troublesome cough. Hot milk or hot lemonade, or, if stimulants are indicated, whisky and glycerin, may be given.

DIET IN HEMORRHAGE FROM THE LUNGS

When a patient has had a hemorrhage from the lungs he should immediately be put to rest and kept absolutely quiet. If the hemorrhage has been severe and the patient is in danger of collapse, in addition to the usual morphin injections, normal salt solution may be given by the rectum or subcutaneously.

The food should be liquid in form. Peptonized or plain milk, liquid

beef peptonoids or similar preparations, fresh beef-juice, bouillon, and the like may be used, and should be given in small quantities at regular intervals—two or three ounces may be given every two or three hours. If there is a tendency to vomit, food may be given by the rectum.

To allay thirst only small quantities of fluid should be given at a time. Later, when the stomach is tolerant, larger quantities may be prescribed.

If there is no recurrence of the hemorrhage and the condition of the stomach permits, a rapid return should be made to an ordinary diet. Meat should be given in abundance to counteract the anemia.

DIET IN PNEUMONIA

In pneumonia, feeding is of the greatest importance. The patient's strength must be fostered, for the better the nutrition is maintained, the more likely will the patient be to withstand the effects of the disease. Formerly, owing to energetic, but often misdirected, treatment, many patients died in the early stages of convalescence. The French writers described their patients as having "died cured"—*mort guéri.*

The same general principles of feeding should be followed as are indicated in all acute fevers. During the course of the disease the patient should receive an abundance of water in addition to the liquid food supplied. Plain water or any carbonated water that the patient may desire should be given. Milk and seltzer may be allowed freely. Lemonade, or orangeade, or water flavored with tamarinds may serve to lend variety. The "imperial drink" (the recipe for which appears at the end of this book) may also be given.

During the height of the disease milk should form the basis of the diet. This may be peptonized or diluted with lime-water. Albumin-water, wine whey, malted milk, beef-juice, Eskay's food, and similar preparations may be employed when milk is not well borne. Predigested liquid beef preparations may be used both for their stimulating effects and as a food. They should always be diluted freely with water, unless, because of vomiting, a concentrated food is indicated.

Food should be given at regular intervals of from two to four hours, according to the patient's condition and the amount he is able to take at one time.

Constipation, flatulence, and vomiting are to be avoided wherever possible. If they do occur, efforts should at once be made to relieve the condition.

In most cases starches and sugars are best omitted from the diet. Fruit may be allowed at any time during the disease, and is of special benefit during convalescence. Most grateful during the severe stage

are orange-juice, lemonade, grape-fruit, and grapes. During convalescence ripe peaches or pears in season may be added to the diet. The return to a general diet should be made gradually, and no solid food should be allowed until the fever has subsided. Then the general dietetic rules for convalescents may be followed.

Pneumonia patients show a wonderful tolerance for alcohol, and it is apparently utilized by the body as a food as well as a stimulant. Large quantities may often be taken without producing any symptoms of intoxication. Should they occur, it is an evidence that the dose has been too large. Alcohol should not be prescribed as a routine measure, but should be ordered as soon as the heart begins to flag. The indication for its use may generally be determined by auscultation before either the symptoms or the pulse point to the need for it. It should be given at once when the first sound of the heart becomes prolonged and weaker. In weak individuals, whatever their age, especially in patients over fifty, alcohol may be begun early. The dose for adults is one-half an ounce of pure whisky, sufficiently diluted, every four hours; this may be increased when necessity arises. In alcoholic subjects it should be given regularly. If it is withdrawn, delirium or collapse may ensue. The usual care should be observed in determining whether the stimulant is doing good or harm. It is best given in the form of pure matured whisky, but champagne, brandy, or rum may occasionally be substituted when these are better borne. In all cases they should be well diluted with plain or carbonated water.

Pneumonia in Children.—The same general plan is to be followed as when the disease occurs in adults, and both lobar pneumonia and bronchopneumonia require the same dietetic management.

The food should be given at regular intervals, or if the child is at the breast, it should be nursed at regular intervals. If a child at the breast is too weak to nurse, the milk may be pumped out and given by means of a stomach-tube or a spoon. The stomach-tube should not, however, be used in pneumonia except as a last resort.

When infants are fed on modified cows' milk, the milk should be further diluted with lime-water. Food should not be given oftener than every two hours, and if a sufficient quantity is taken, the interval may be lengthened to three or four hours. Milk is the most important food, and may be diluted with lime-water or with carbonated water. It may be peptonized partially or completely, or be prepared with the Peptogenic Milk Powder, with Eskay's, Mellin's, or similar foods, or malted milk may be used. Buttermilk, plain or prepared after the method directed in the section on Infant Feeding, may be tried. Kumiss is often retained where plain milk is rejected. If milk is not well borne, barley or oatmeal gruels may be used by way of variety. If these cause flatulence, they should be avoided. Albumin-water

and fresh beef-juice are useful foods, and such preparations as Panopepton, liquid beef peptonoids, and predigested beef are of great service when other foods are not well retained or assimilated. Beef broth or other meat broths may occasionally be given.

The problem of feeding children suffering from pneumonia is frequently a very difficult one, for while they may take a food readily, they may refuse it the next time it is offered or vomit it if taken. When milk is well borne, it should constitute the diet, but where it is not, the physician must have as many resources as possible. From one to six ounces, according to the age and condition of the patient, may usually be given at a time, but it may at times be necessary to give the food in teaspoonful or tablespoonful quantities.

If there is much vomiting, equal parts of lime-water and cinnamon-water may be given to great advantage. A teaspoonful of this mixture fifteen minutes before feeding may allow the food to be retained where it would otherwise be rejected.

Water should in all cases be offered the child from time to time, and the mistake of forcing the child to take food when it wants only a drink of water should be avoided. If there is no flatulence, the carbonated waters are often very well borne.

Alcoholic stimulants are generally needed and are well borne. Whisky or brandy diluted with at least eight parts of water may be given, a little sugar or glycerin being added to overcome the sharp taste and render it more palatable. In pneumonia, as in other diseases, alcohol is borne better when it is given in small quantities and frequently, than when larger doses at greater intervals are prescribed. The average interval is two hours, but it may be given hourly or even more frequently when occasion demands.

DIET IN DISEASES OF THE CIRCULATORY SYSTEM

DIET IN DISEASES OF THE HEART

Diet in Acute Heart Disease.—In acute endocarditis and pericarditis the diet may be difficult to arrange satisfactorily. In general, it should be ordered as in any acute infectious disease, and if there is broken compensation and edema, the suggestions made below for the same stage of chronic disease should be followed.

Diet in Chronic Heart Disease.—This may be considered under two heads, the stage of compensation and the stage of broken compensation, and a few words may be added to cover the period of threatened rupture of compensation.

During the period of perfect compensation the patient should observe the general rules which apply to all patients with heart disease. The following of these will in many cases postpone the stage of broken compensation. Many patients are careless, and it is not until the

first symptom of threatened rupture that they can be induced to take care of themselves. In addition to food it is highly important that the patient should avoid hurry, worry, and irregularity of life.

The meals should be small—more should never be given than the patient can easily digest. If the stomach is overloaded, the diaphragm is pushed up and displaces the heart, and this may occasion palpitation and dyspnea. If the meals are too large, the residue of any digested food in the intestine may undergo fermentation and cause flatulence, with its attendant disagreeable symptoms.

The meals should be simple and well cooked. Improperly prepared food is a cause of indigestion, and may produce flatulence or discomfort. The food should be of a kind that is easy of digestion. A sufficiently long interval should be allowed to elapse between meals, and eating between meals should be strictly prohibited, as even small portions of food taken while digestion is in progress may give rise to flatulence in these patients.

The meals should all be of about equal size; while the evening meal may be a little smaller and lighter than the others, and the principal meal should be taken at midday, there should, as has been said, be but comparatively little difference in their size, and the patient should be instructed carefully in this regard.

The food should not be taken too hot nor too cold. The amount of food and its choice should be largely that of a person of the same size in health. The amount of protein should be about 120 grams per day for the average-sized person, and this may often be reduced to advantage. In case the kidneys are affected, it may still further be reduced—some 20 to 40 grams. The amount can be regulated by careful observation of the patient. The aim should be to get the patient to normal weight and keep him there, to have as perfect digestion as possible, and, above all, to avoid constipation. The remainder of the diet should consist of the usual quantities of fat and carbohydrate. If the patient is gaining in weight, the total amount of food may be diminished, and especially the carbohydrates. If these latter cause flatulence, or any other gastric or intestinal symptoms, they should be reduced.

All highly seasoned food and the condiments in general should be omitted from the diet, as they tend to stimulate the appetite of the patient, and may cause him to take more food than it is necessary or desirable for him to have.

Stews and fancy dishes should also be omitted, as should the foods usually classed as difficult of digestion, such as fried foods and the like.

The amount of fluid should not be too large nor too small. The total fluid should perhaps not exceed six to eight glasses a day, with an occasional water-drinking day. Tea and coffee may be taken in

moderation if they agree. In some individuals they may be omitted to advantage, and these are the persons who suffer from flatulence, indigestion, wakefulness, etc., after the ingestion of either.

Tobacco is best forbidden, except in seasoned smokers, in whom the tolerance for it has been well established by years of indulgence. Even in these the amount should be limited.

The diet should consist largely of milk and of dishes made from this food, eggs, rare meats, especially mutton and beef, poultry, fish, and oysters. Well-baked bread, rolls, or biscuits, which are never to be eaten warm, and cereals in moderate quantities may be allowed. Well-cooked potatoes, spinach, asparagus tips, cauliflower tops, and similar vegetables may be taken, all stalks being avoided.

The diet-list should be simple, and such as will not require burdening the patient with complicated directions.

As compensation becomes impaired numerous disorders of digestion occur and require care and attention. The patient with heart disease may develop a distaste for food, and this will often tax the ingenuity of the physician.

As blood stasis sets in, constipation is apt to occur. Hypostatic congestion of the liver comes on, causing lessened metabolism and consequently interfering greatly with the general nutrition. The stomach and intestine are affected, and a chronic catarrhal condition of both is generally present.

The quantity of fluid given should now be regulated carefully, neither too much nor too little being given. A glass of Vichy half an hour before eating will help to prepare the stomach for a meal, and will, as a rule, be excreted promptly. Fluid is absolutely necessary for metabolic changes, and may be taken in the form of the "imperial drink," elsewhere described, between meals. A glass of hot water flushes out the body, and, as it is rapidly excreted, does not add materially to the amount of fluid present.

In the Oertel treatment of heart disease the fluids are allowed only in a very limited degree. If the patient is on a milk diet, other fluids besides milk should be given in comparatively small quantities.

If *edema* is severe, the food may be given in as concentrated a form as possible. (See also Karell Diet.)

If *flatulence* is troublesome, fats, starches, and sugars, as well as beer, pastry, and stews, are to be avoided. No solid food should be taken between meals. Coffee or tea taken with the meals may give rise to flatulence. They may, however, in some cases be taken during the day, at a time when the stomach is empty; they should be freshly prepared and should never be strong. Only such quantities of food as the patient can digest should be allowed, and, if necessary, digestion may be aided by giving essence of pepsin or other digestives. In

some cases a milk diet may become necessary. Sometimes buttermilk, or whole milk that has been inoculated with the lactic acid bacillus, is of great service.

Sudden dilatation of the heart occurring during or following any acute disease requires rest and a milk diet.

Palpitation and dyspnea are often caused by the ingestion of too abundant meals; if persistent, the food should be given in smaller quantities and at shorter intervals. Four or five small, instead of three large, meals may be taken at regular intervals, or a milk diet may be ordered for a time. The general management may be such as has been suggested for flatulence. Tea, coffee, and tobacco should be avoided, and effervescing drinks may also be omitted. If there is constipation, stewed fruits, especially prunes or figs, are useful.

Gastric disturbances are best met by rest and a milk diet for a time, with a gradual return to the ordinary diet or a diet such as is advised for cases of gastric catarrh. Much relief frequently follows the drinking of a glass of hot water or of Vichy half an hour before a meal.

As ruptured compensation is accompanied by effusion, something must be said with special reference to the removal of fluids from the body. Here, indeed, feeding is a difficult task, for the patient usually has a disgust for food. As Broadbent says, the object is to keep down the volume of the blood while maintaining its quality. If the patient is very ill, nourishment may be administered every three hours. If he is able to be about, it will often be well to allow him to take his meals with the family at the regular meal-time. He may be given chicken, tender meats, fish, oysters, junket, and other forms of light food. When but little is taken at the regular meal-time, food may be given between the meals, at regular periods, time being allowed for complete digestion to take place. Milk, albumin-water, egg and milk, soup, or beef-tea in small quantities are useful for this purpose. Broadbent recommends meat or chicken jelly or meat extracts, for their stimulating effect on the heart. Potted-meat sandwiches or meat pulp, prepared as directed for tuberculous patients, may be given. In Germany raw ham is sometimes prescribed. Constipation may often be avoided by adding stewed fruit, prunes, or figs, or vegetable purées, all in small quantities, to the diet. If necessary, predigested foods may be used.

Fluids other than milk and soups should be taken in as small quantities as possible. "Imperial drink" or hot water, as previously suggested, may be given to quench the thirst.

HEART LESIONS IN CHILDREN

The diet is essentially the same as that for adults. Children who are able to be about require careful supervision, the treatment being

along the same general lines as were laid down for adults. Less food is required than in health, and the meals should be smaller. Care should be exercised to see that the food is eaten slowly and well masticated. The diet should consist largely of milk, eggs, and meat, with or without a cereal, and vegetables, the last being of the more easily digested varieties, such as well-cooked spinach, asparagus-tips, and cauliflower tops, as these are least apt to cause flatulence. Fresh young peas, mashed and strained, and fresh, tender string-beans may also be allowed. Potatoes, either well baked or well boiled and mashed, may be eaten in small quantities. All coarse and stalky vegetables are to be avoided. If there is flatulence, the carbohydrates, as well as the fats, may be very much lessened or omitted temporarily.

In the more severe cases milk agrees better than any other form of food, and should be given in small quantities at regular intervals. As a rule, it should not be taken too cold. The various modifications of milk and other liquid foods that have been mentioned in connection with pneumonia may be employed. In some cases, especially when dropsy is severe, there is no desire for food, and the problem of feeding then becomes a difficult one. In these cases predigested foods of various kinds, raw meat-pulp, as advised in tuberculosis, and beef-tea, beef-extract, and the like, may be tried.

SENILE HEART

Balfour's little book on "The Senile Heart" will prove a valuable guide to the care and management of the aged. In his chapter relating to diet he says: "Cardiac troubles are always alarming, particularly in old age, but much may be done to relieve the patient and to prolong his life. Attention is to be paid to the little things of daily life—the little things of eating, drinking, and doing—that influence the patient's comfort and gradually turn the scale of health in his favor. The physician's regulations are often pitted against the habits of a lifetime, and difficulty may be had in securing acquiescence. All heart affections of the old are not necessarily senile in character or origin. Many cases may be of very long standing. Senile cardiac failure is essentially based upon imperfect metabolism. The diet must be regulated to suit the patient, and certain things must be considered. Most of the patients are below or at their usual weight. These require careful regulation of a normal dietary, to be given presently. A smaller number are over their normal weights, and suffer more from breathlessness than the preceding class of cases. These require to be specially dieted and cared for, so as to remove the obesity without diminishing the cardiac energy or the strength of the myocardium. Lastly, there are those in whom there is more evident failure of the myocardium. There are more evidences of dilatation of the heart and of the tissues. Such cases require a specially dry diet."

Four Important Rules.—1. An interval of five hours should be allowed to elapse between meals.

2. No solid food should be taken between meals.

3. All persons with weak hearts should take their principal meal in the middle of the day.

4. Persons with weak hearts should take their meals in as dry a form as possible.

All indigestible food should be avoided. Especially to be mentioned in this class are dried, salted, or otherwise preserved meats, cheese, pastry, all other foods in which fatty matter has undergone prolonged exposure to heat, and all sweets and nuts; owing to their liability to cause flatulence, vegetable food must be chosen with care. Vegetables of the cabbage family, and carrots, turnips, and parsnips are regarded with disfavor by Balfour. Even potatoes should be eaten sparingly. Fruits should not be crowded into a meal as a dessert, but may be allowed to form part of the meal, especially at breakfast or at a midday dinner.

No good is to be gained by attempting to enforce dietetic rules founded on the number of grams of carbon or nitrogen required to carry on the processes of life.

The foods to be allowed persons with weak hearts are the tender varieties of white fish, chicken, rabbit, game, mutton, or well-grown lamb, all of which Balfour gives in preference to tough beef. One well-boiled, ripe, mealy potato may be allowed at dinner. Spinach, since it does not cause flatulence, is the safest vegetable; asparagus-tops, onions, and tomatoes may be taken in moderation. Peas, beans, and other leguminous foods, when fresh, young, and green, may be partaken of in moderation.

Not more than five ounces of fluid, and if possible less, should be taken with a meal. If water is desired with the meals, it should be taken hot and sipped slowly. If tea is used, it should be weak—a teaspoonful of the tea to five ounces of water, steeped for not more than three minutes. Coffee may be sweetened to taste, and taken black or with cream. Chocolate and cocoa are too rich for those with weak hearts, but if taken alone may occasionally be useful.

Alcohol should be prescribed only as it is needed. So many patients have been accustomed to its use all their lives that it cannot be cut off altogether. For those to whom alcohol is permitted half an ounce of whisky, brandy, or gin may be given in three or four ounces of water twice a day, together with their food; or a single glass of sherry or port or two glasses of any lighter wine, such as hock or claret, each glass to hold two fluidounces, may be ordered. The stronger wines are best omitted, as they are liable, if taken in larger quantities, to give rise to dyspepsia. Champagne is, as a rule, forbidden. Idiosyncrasies occur in regard to the effect of wine, so that

the individual case must be considered before it is ordered. Alcohol is best given in the form of pure whisky and water, always in extreme moderation. As a stimulant for a weak heart, small quantities of alcohol are frequently prescribed, to be taken at various times during the day. This is most injurious treatment, for although the primary effect of alcohol is stimulating, secondarily it is depressant. A better plan is to direct such a patient to take two or three sips of water, as hot as can be swallowed, occasionally throughout the day. Apart from that taken in the food fifteen ounces of water a day are all that should be allowed, but if severe thirst is complained of, a half pint of hot water may be sipped about four hours after each meal or only after the principal meal. This cleanses the stomach and prepares it for rest. Hot water quenches the thirst better than does cold. The thirst is usually due to a catarrhal dyspepsia, and soon disappears after the diet has been regulated. The following is Balfour's dietary, which is easily modified:

"*Breakfast* 8.30: One small slice of dry toast, weighing about an ounce and a half, with butter; one soft-boiled or poached egg, or half a small haddock, or its equivalent in any other fresh white fish, with from three to five ounces of tea or coffee, with cream and sugar. If there be any difficulty about the tea, it may be replaced by a similar quantity of infusion of cocoa-nibs, or milk and hot water, or cream and seltzer water. Some prefer oatmeal porridge, with milk or cream, and in ordinary circumstances this need not be objected to, provided not more than four or five ounces of milk be taken, and the porridge be not more in quantity than three or four ounces of oatmeal, well boiled: provided, also, that porridge alone be taken, and not porridge first, followed by tea, toast, etc., which is destructive of all comfort, both for stomach and heart.

"The *principal meal* of the day, whatever it is called, lunch or dinner, should be taken about 1.30 or 2 o'clock, and may consist of two courses, not more—fish and meat, or fish and pudding, or meat and pudding. Soups, pastry, pickles, and cheese are absolutely forbidden. White fish and meat with short fibers are preferred. Half a haddock, or its equivalent in any other white fish, boiled in milk, steamed, or broiled, never fried; wing and part of the breast of a chicken, or its equivalent in sweetbreads, tripe, rabbit, game, or mutton; one single potato or a little spinach. For pudding, any form of simple milk pudding may be taken, or about half a pound of such fruits as pears, apples, grapes, etc., either cooked or uncooked. During this meal four or five ounces of hot water may be sipped if desired.

"From 5 to 6 three or four ounces of tea may be taken if desired, infused, as in the morning, not longer than four minutes, and with cream and sugar if wished; but no solid food must be taken with it

—not even a morsel of cake or biscuit. If there be any difficulty about the tea, four or five ounces of hot water may be substituted for it, and if there seem any need for a stimulant at this time, a teaspoonful of Liebig's extract of beef may be stirred into it.

"Supper, or the last meal of the day, must always be a light meal. It should be taken about 7, and may consist of white fish and a potato, or toast, with butter, or some milk pudding, or bread and milk, or Revalenta, made with milk or with Liebig's extract of beef. At bedtime, four or five ounces of hot water will soothe the stomach, promote sleep and pave the way for a comfortable breakfast next morning."

When there is anasarca, the following "dry diet" is recommended by Balfour. (See also Karell Cure.)

"*Breakfast.*—One single slice of dry toast, weighing about an ounce and a half, with no butter, but with a single cup of tea infused not longer than four minutes, with cream and sugar, amounting in all to not more than four ounces, and nothing else.

"*Dinner.*—Not more than the lean of two chops, or its equivalent in chicken or fish; no vegetables; as much dry toast as may be desired; half an ounce of brandy, whisky, or Holland gin, in three ounces of water, and nothing else.

"*Supper.*—As much dry toast may be taken as is desired, along with half an ounce of brandy, whisky, or gin in three ounces of water; and nothing more."

It is not desirable that a patient in this condition drink much, even between meals, but if thirsty, he may be permitted to sip slowly three or four ounces of hot water about an hour before each meal.

ARTERIOSCLEROSIS

In most cases of arteriosclerosis symptoms of senile heart occur at the same time, and the same general principles may be followed as were directed for that condition. The French particularly advocate a milk diet in the treatment of arteriosclerosis, and where there are headaches, insomnia, and other untoward symptoms, an absolute milk diet may be used with advantage. As soon as the symptoms disappear a mixed diet may be substituted. (See Milk Cure for methods of giving milk.) Mineral water may be prescribed, or trips may be made annually to mineral springs. Alcohol should be prohibited. A diet similar to that used in high blood-pressure will be found effective in many cases.

HIGH BLOOD-PRESSURE

Very little is known about the relation of diet to hypertension except where there are other definite changes in connection with it. Strouse and Kelman (Archives Int. Med., 31, 151, February, 1923)

have shown that patients with high blood-pressure and slight or no renal impairment have marked variations which are not dependent on the protein intake. The usual plan is to place the patient on a low protein, low salt diet, but the whole subject is a fertile field for further investigation.

Where there is renal impairment the diet should be managed as outlined for that condition and under salt-free and low protein diets.

Where there is indicanuria the patient should be put on a non-protein diet to start with, and then on a diet in which meat is either eliminated altogether or given in but small quantities.

Where there is overweight a reduction cure should be undertaken as outlined under obesity. An interesting suggestion rather different from the usual for this combination has been made by Terry (Jour. Amer. Med. Assoc., October 13, 1923, lxxxi, 1283). He claims excellent results in fat women with high pressure where other disease has been excluded. The diet used was chiefly for working women, contained about 87 grams of protein and about a total of 1700 calories. If there was no loss of weight on this, the diet was reduced by diminishing the butter (200 calories), then the bread (300 calories), and then the starchy vegetables. The following is a suggestion as to meals:

Breakfast: One orange or apple.
One teaspoonful sugar (rounded).
Coffee with 4 tablespoonfuls of milk.
Two eggs, or a piece of lean meat, 5 by 3 by ½ inch.

Lunch: One cup of beef tea or clear soup.
Tea with 2 tablespoonfuls of milk.
One level teaspoonful of sugar.
Two slices of bread, 4 by 4 by ½ inch.
Spinach, celery, or other green vegetable (1 saucerful).
Lean meat, 5 by 3 by ½ inch.

Dinner: One cup of beef tea or clear soup.
Tea with 2 tablespoonfuls of milk.
One level teaspoonful of sugar.
One slice of bread.
Butter, one-half pat, ½ by ½ by ¼ inch.
Meat, 5 by 3 by ½ inch.
One potato or two tablespoonfuls of any starchy vegetable without grease.

In addition to the diet, exercise, massage, baths, purgation, and sweats are useful in selected cases, and a few weeks once or twice a year at some of the springs is of great value if the patient can afford it.

ANEURYSM

In most cases of aneurysm that are proving troublesome the treatment consists of rest, a restricted diet with a limited amount of fluid, together with potassium iodid. From ten to twenty grains of the iodid three times a day are sufficient.

Certain cases of aneurysm may be relieved by rigorous dieting. The saccular forms, and especially cases of aortic aneurysm with small openings, are most apt to improve under this treatment. Dieting is also helpful, it is said, in traumatic aneurysm. Tuffnell, of Dublin, advised the following diet:

Breakfast.—Two ounces of bread with a little butter and 2 ounces of milk.

Dinner.—From 2 to 3 ounces of meat without salt, and 4 ounces of milk or claret.

Supper.—The same as breakfast.

Absolute physical and mental rest must be secured for the patient, and a competent nurse who will see that the diet is strictly adhered to is essential. Thirst may be relieved by small quantities of acidulated drinks or by sips of hot water. Potassium iodid may be prescribed, as may also morphin. Few patients, however, are willing to undergo the suffering that such treatment entails, and not many will persist in it for more than several weeks. Tuffnell advised that it is to be followed for several months, and he and others report cures in certain cases. The anemia that follows may be extreme, and may leave the patient in a serious condition.

Broadbent advises rest and small, equal-sized meals, taken at regular intervals. The meals must be concentrated, and bulky substances, such as rice, potatoes, and bread, are to be excluded from the dietary. The amount of water taken in twenty-four hours should not exceed forty ounces, and as much less as possible is to be taken. Twenty-four ounces he places as the minimum.

The object of the treatment is to produce the slow circulation of a condensed blood in the hope that fibrin may be formed in the sac. Burney Yeo does not favor such severe dieting.

When the case is not a suitable one and is not giving especial trouble, it is probably best to recommend a quiet life and a simple diet, avoiding indigestible articles of food and those that cause flatulence. As Osler has said, the medical profession has furnished numerous examples of men with aortic aneurysm living for considerable periods and doing good work. Of these the late Hilton Fagge was a notable example.

ANGINA PECTORIS

In this disease diet is of the greatest importance. The majority of cases occur in "large eaters," and, as Osler says, there is "death in the pot." As a rule these patients realize that overeating is harmful to them.

The meals should be small and easily digestible, and all rich, highly seasoned food, as well as anything that causes fermentation, should be carefully avoided. Flatulence is a symptom that must, so far as

possible, be avoided, for as soon as the stomach becomes distended distress follows that may produce an attack. The evening meal should be small, and eating late at night should be prohibited.

If the patient is, in addition, the subject of gout or glycosuria, his diet must be regulated accordingly. The diet suitable for various cases differs widely, and personal idiosyncrasy must always be taken into account.

In his lectures on angina Osler calls to mind that Dr. Smollet, in Humphrey Clinker, makes one of his characters, Matt Bramble, say: "For my own part, I have had a hospital these fourteen years within myself, and studied my own case with most painful attention, consequently may be supposed to know something of the matter." An intelligent patient should know what food does and what does not cause flatulence. Flatulence is most apt to occur in fat flabby patients and in those with weak hearts and arteriosclerosis. Hot water taken half an hour before meals may be useful.

In those with whom the drinking of stimulants is a life-long habit alcohol may be allowed, best in the form of hot toddy at bedtime. To quote Osler again this may prevent the flatulence that is apt to come on during the early morning hours.

ANEMIA

Acute Posthemorrhagic Anemia.—The reader is referred to the section on Diet after Operations for suggestions as to the diet in this disorder. In the case of the smaller hemorrhages, which are rapidly recovered from, the usual diet may be followed. In the more severe forms, special care may be required. If the anemia that follows a severe hemorrhage becomes chronic, the patient is to be managed the same as in chronic secondary anemia. If much blood has been lost, fluid should be supplied to the body in the form of normal salt solution, by transfusion into a vein, subcutaneously, by the rectum, or by the mouth, according to the condition of the patient. In most cases the fluid part of the blood is rapidly replaced. If the hemorrhage has been from the stomach or bowel, special management, as detailed under their respective headings, is necessary.

If the patient is very weak, cold milk is usually the most acceptable form of food. Hot milk is preferred by some, and is best for many cases. Fresh beef-juice and weak beef-tea are valuable, as is also albumin-water. As soon as the patient is able to eat, a diet containing considerable protein and the fresh green vegetables should be administered, as well as milk, eggs, rare or raw meat, with spinach, asparagus-tips, apples, strawberries, and other fresh fruits and vegetables.

Indigestible articles should be avoided, and strong tea, coffee, and the much concentrated beef-teas should not be taken, especially in the acute stages.

According to the meager experiments and observations that have been made on this subject, the metabolic processes of the body are either about normal or similar to those going on in a condition of hunger. Iron in some form is advisable in the severer cases.

Chronic Secondary Anemia.—Efforts should be made to locate and remove the cause. The diet should be about the same as that recommended for chlorosis. Fresh food, milk, eggs, meats, green vegetables, and fresh fruits are the most important articles of diet. Fresh air and sufficient rest are also essential.

Pernicious Anemia.—In spite of the grave anemia the body fat and muscles often remain for a considerable time but little diminished in size. The blood destruction, however, is progressive, and tends to a fatal ending. Rest, removal to a different climate, fresh air, and attention to the diet may in some cases prolong life. Nevertheless the tendency of the disease is to become progressively worse.

Owing to the anorexia, vomiting, and diarrhea that are apt to be present, the diet is a matter of importance. Coupland and Hunter claim that a carbohydrate diet is better borne than one composed largely of proteins. As the result of experiment, Hunter has been led to believe that intestinal putrefaction occurs less often on a milk and carbohydrate diet.

Predigested foods, prepared infants' or invalids' foods, raw meat-juice, and similar articles of food may be allowed. Small quantities of alcohol may also be prescribed.

During recent years the bone-marrow of long bones of animals has been recommended highly in cases of pernicious anemia. The marrow is eaten raw, in doses of from one to three tablespoonfuls twice daily. The authors have obtained good results in several cases from this form of treatment.

Barker and Sprunt have made some observations on the Addison-Biermer type of pernicious anemia, and in addition to the other therapeutic measures they suggest a rest cure, beginning on a milk diet, two and a half ounces every two hours from 7 A. M. to 9 P. M., the two hourly quantity being increased each day until by the sixth day the patient is receiving about three liters. On the seventh day a small piece of bread and a little jam is allowed at breakfast and at midday a trayful of easily digested foods. Taking the milk is insisted upon, even if there is some vomiting it is continued at regular intervals. The portions of the solid foods are at first not large, but during the next few days are rapidly increased until the patient is on an abundant diet, rich in protein, and if he is thin, in carbohydrates and fat also.

At this time a raw egg with a little orange juice is given after each meal and later on two eggs after each meal may be given. Extra milk is given as far as possible, with meals rather than between them.

With this method a patient may within two or three weeks be induced to take six eggs, a quart and a half of milk and a pint of cream each day, in addition to three full meals, a dietary containing from 4,000 to 5,000 calories. When the patient is obese a large amount of protein, meat and eggs, is given, together with green vegetables in purée form and stewed fruits. The carbohydrates and fats are low and the total value per day of the food does not exceed 1,000 or 1,500 calories. More intelligent patients are taught to figure out the number of calories in the diet and keep a food chart, which is easily done by using Locke's tables (reprinted elsewhere in this volume).

CHLOROSIS

The diet for chlorotic patients is not generally understood, and therefore requires especial study.

In chlorosis no changes occur in either fat or muscles. Some patients are fat while others are thin, this depending for the most part on accidental circumstances, and bearing only an indirect relation to the anemia. The thin patients are usually those individuals who are of that habit; those who have co-existing disease of the stomach; those who take too little food and who are, in consequence, suffering from malnutrition; or lastly, those who must undergo considerable bodily exertion, usually in getting their livelihood.

The fat patients and those who are often edematous looking are individuals who are either fat by nature or who are receiving too much milk or other fluid with their diet.

Under a proper diet no change in the weight may occur; or in the case of the fat, edematous-looking patients, there may be a loss in weight while the anemia is improving, or if the patient has been taking too little nourishment or is doing too much work and is thin in consequence, there may be a gain in weight. The metabolic processes, so far as is known, are the same as in health. Owing to the lowered hemoglobin value of the blood, the patient is not able to exert herself much without producing great fatigue.

In the treatment of the chlorotic patient three things are important: iron, sufficient food at proper intervals, and rest.

Regarding the diet, the quality and the quantity of the food may be the same as in healthy individuals. The meals should be given at regular intervals, not too widely separated—usually not more than three hours apart. In consequence of the shorter interval and because the patient's desire for food is apt to be lowered, the meals should be small. The appetite is capricious, and while the regular meals may be left untouched, such undesirable articles as pickles and sweets may be greedily devoured in the intervals. This tendency should be controlled and nothing allowed between the meals. Von Noorden recommends five meals daily—at 8, 10.30, 1, 4.30, and 7 or 7.30. This same

observer also insists on the value of taking an abundance of protein food at breakfast, giving as his reason that protein is the only food (alcohol not being considered) that is ready for use in the body shortly after ingestion. Carbohydrates for the most part go first to the liver, and fats are too slowly absorbed. The patient who takes the customary continental breakfast of coffee and rolls has a long wait before the cells receive adequate nourishment. The kind of protein food is of little importance, and may be either meat or eggs; meat is, however, especially recommended, and should be taken regularly for breakfast in a definite quantity.

In general the diet should also contain sufficient protein, and von Noorden advises the use of such preparations as somatose, nutrose, protogen, or eucasin, when necessary to increase the quantity of protein.

Milk is generally prescribed in too large quantities. This should be avoided where the appetite is small, as a glass of milk in these cases generally checks any further desire for food. It is also to be avoided in those cases in which the appetite is fair but the patient shows a decided tendency to take on fat or to become somewhat edematous looking. In these individuals the cells retain too much water. When there is atony of the stomach, water is to be taken in small quantities. Milk is to be used by patients who are thin and where there has been a preëxisting malnutrition. Milk and cream mixed is of great value.

Fresh fruit and vegetables, particularly the green vegetables, are of especial value and may be partaken of freely. All kinds of fresh fruit in season are to be recommended, avoiding small-seeded berries where there is irritability of the stomach. If fresh fruits can not be obtained, properly prepared, evaporated fruit may be eaten and helps to regulate the bowels. Fresh fruit and vegetables do not, as a rule, cause the disturbance of the stomach so often attributed to them. In cases of ulcer of the stomach and often in other gastric disorders they must, however, be avoided. When fruit disagrees, it usually causes pain or flatulence. Von Noorden recommends that it be taken in the afternoon or with the meals. For Americans some fruit at breakfast is of value, but it should not be eaten to the exclusion of the more important meat.

In the ordinary case of chlorosis alcohol may be dispensed with. If given, it should be done guardedly, as patients become accustomed to taking it to relieve the feeling of weakness and faintness. A small quantity of port, sherry, or one of the other stronger wines may be allowed as an appetizer half an hour before the midday meal. In the thin or overworked a good beer may be taken in moderation with the principal meals. Red wine, which is often recommended, is of no particular value.

Von Noorden gives the following suggestions for the selection of the diet in chlorosis:

The breakfast may be taken in bed, or the patient allowed to rest on a lounge for an hour after the meal. Many patients will go to sleep, and this should be encouraged by darkening the room and avoiding disturbing noises. Two or three ounces or more of meat should be taken, with as little other food as possible. A slice or two of toast or a piece of unsweetened zwieback may be given, together with a small quantity of tea or coffee with but little sugar or cream.

The second breakfast consists of two eggs, prepared in whatever way the patient prefers, with toast and butter and a glass of milk. A tablespoonful of cognac may be allowed in the milk or a small glass of Madeira, sherry, or port may be given.

The midday meal should be preceded by a complete rest for half an hour. The patient may eat whatever she desires, but meat should always be eaten first. If the appetite is poor, soup should not be allowed, or should be given after the meat has been taken. Thirst is generally marked at this time, but fluids should not be taken until the end of the meal, so as not to disturb the appetite. After eating the patient should rest from one-half to three-quarters of an hour. If there should be pain or discomfort in the stomach, hot applications may be made to the abdomen.

In the afternoon, cooked or raw fruit with bread or zwieback, or, if fruit is forbidden, tea or cocoa and toast may be given. If there is no tendency to superacidity of the stomach, bread and honey or fruit-jelly may be allowed. A glass of milk or milk and cream should be taken after the meal.

The evening supper should be as simple and as unirritating as possible. Four times a week a thick soup or gruel of oatmeal, barley, rice, or tapioca may be given, with meat-broth and butter or with milk and butter. If desired, eggs or other light foods may be given instead. Stewed fruit may also be allowed several times a week. If the hunger is not satisfied cold meat may be permitted in addition. On other days eggs, meat, or fish may form the principal part of the evening meal. A glass of well-brewed beer or a glass of milk may be given at bedtime, which should never be later than 10 o'clock.

The diet in emaciated patients, since there is apt to be either loss of appetite or disease of the stomach, is sometimes difficult to regulate. A change of cooking may be beneficial. Von Noorden allows 100 grams of protein daily with butter, cream, or cod-liver oil. A moderate amount of carbohydrates may be allowed, but not to the exclusion of other food. Milk may be given an hour before rising in the morning, and alcohol may often be used with advantage.

When the patients show a tendency to become fat and apparently edematous, the diet must be made as dry as possible—somewhat similar

to the dry diets recommended in certain heart diseases. Sweating may also be induced in order to reduce the amount of fluid in the tissues. Rapid recovery sometimes follows this method of treating flabby chlorotic patients. When there is disease of the stomach, the diet is regulated accordingly. Constipation is to be relieved by suitable diet, or, if necessary, drugs may be resorted to.

LEUKEMIA

The diet in leukemia should be a general mixed one, but should contain as much protein as possible. The choice of foods will depend largely on the condition of the stomach and intestines. In leukemia the metabolic processes are heightened.

During the early stages, however, they remain about normal. As the disease progresses there is said to be an increase in the excretion of nitrogen. This calls for an extra amount of protein food to make up the deficiency. This may, however, be a difficult matter, owing to the liability to cause disturbance of the stomach and intestines. The diet should be arranged so as to contain the largest possible amount of easily assimilated protein material. Sugars, starches, and fats should be given sparingly, since their digestion requires too much time before they can be utilized by the tissues.

Milk and the milk derivatives, such as buttermilk and kumiss, eggs, and the more easily digested meats should form the bulk of the dietary. When they agree, bread, toast, and well-cooked cereals may be taken in moderation. Of the vegetables, spinach, asparagus-tips, cauliflower tops, and young green vegetables are to be preferred. The selection of the diet will often be governed by complicating bowel disorders.

Alcohol may be allowed as needed, and the desires of the patient should be consulted as far as possible regarding the form in which it is to be taken.

PURPURA HAEMORRHAGICA

Litten gives the following suggestions as to the diet in this disease: The food must be bland and should be given cool. Coffee, strong tea, and spirits should be strictly forbidden. Alcohol may be allowed when there is collapse. Milk and somatose in milk are suggested as the most valuable foods, but the diet may be arranged as in any acute febrile condition. A diet containing a considerable amount of gelatin has been recommended. Other authors suggest the use of an antiscorbutic diet, although no good reason exists for this, except that some of the so-called cases of purpura may in reality be scurvy or something akin to it.

HEMOPHILIA

A general diet, of which milk, however, forms a considerable part, is suggested by Litten, who also recommends the use of the fresh green vegetables and salads. Fresh fruit and lemonade may be used

freely. Coarse food, especially the coarser vegetables, should be avoided. Calcium containing foods have been thought to be of use. For Calcium content of foods see Oxaluria.

DIET IN DISEASES OF THE GENITO-URINARY SYSTEM

Urine and Food.—The urine bears a direct relation to the quality and quantity of the food ingested, as well as to the quantity of fluid taken and the amount of work done by the individual. Many variations in the urine occur that are due to food or drink and that are normal. When the kidneys are diseased improper food may bring on dangerous or even fatal conditions. After a large meal of any kind the urine becomes alkaline temporarily.

The ingestion of large quantities of fluid and the eating of juicy fruits or vegetables tend to dilute the urine, and to render it less acid and its solid contents relatively less. With milk diet the urine becomes acid and indican may be found in it. A concentrated dry diet decreases the amount of urine, increases the specific gravity, and makes the reaction more acid. Animal food and the more nitrogenous vegetables increase the amount of nitrogen compounds and the acidity of the urine. Vegetables increase the carbonates and the earthy salts of the urine. A purely vegetable diet renders the urine alkaline. Thompson states that Cantani maintains that large quantities of vegetable acids will render the urine alkaline.

Lipuria, according to Halliburton, may be caused by a diet rich in fat, even when the kidneys are normal.

Phosphaturia is believed to be increased by the use of potatoes, fruit, and all fresh green vegetables, and to be decreased by adhering to a diet from which these have been eliminated. Such a diet would include meat, eggs, milk, cheese, cereals, and the legumes.

Oxaluria.—This is a term applied to a condition where calcium oxalate crystals are deposited in the urine. The normal limit of oxalates excreted in twenty-four hours has been placed by Senator at about 20 mgm. Whilst oxaluria may be regarded as an expression of a disturbance of metabolism, the quantity of oxalates excreted is only one factor to be considered. The second part of the question consists in the power of the urine to hold the otherwise insoluble calcium oxalate in solution. The solubility of this salt depends upon the acid phosphates, especially upon the quantity of magnesium salt present, and naturally it is influenced by the amount of calcium excreted in the urine. A urine containing a large quantity of magnesium phosphate and a small quantity of calcium salts will hold more calcium oxalate in solution than urine containing the reverse.

Oxaluria is accompanied by a number of nervous and gastric disturbances, generally spoken of as either neurasthenia or nervous dyspepsia. The exact relation of these symptoms to oxaluria is not

always clear, and clinically the symptoms which arise from the presence of oxalate crystals irritating the urinary passages and the danger of formation of stone, either in the kidney or bladder, are of much more importance.

Previous to the experiments of G. Klemperer and Tritschler, it was not certain whether the oxalic acid excreted was derived from the food or from metabolic processes. It is beyond question, however, that foods containing oxalic acid when taken into the body increase the amount of calcium oxalate in the urine. If oxalic acid is neutralized with carbonate of soda and given to an individual, but a small part of it can be recovered in the urine or stools, the greater part of it disappears. Of the oxalic acid taken in the food materials, as in spinach, about 20 per cent. can be recovered in the urine and stools, most of this in the urine, whilst 80 per cent. of it disappears. This disappearance is caused by bacterial and chemical action in the intestines, changing the oxalates into other compounds. Oxalic acid is also destroyed in the blood, whilst calcium oxalate is not. When foods containing oxalic acid enter the stomach a part of it is dissolved in the gastric juice and about 10 per cent. absorbed. In the blood and lymph circulation this is changed into calcium oxalate and on the following day it is excreted in the urine.

Besides being taken into the body directly as oxalic acid, certain food substances are changed in the processes of metabolism into oxalic acid or oxalates and so increase the quantity excreted in the urine. Substances containing many nuclei, as glands and also muscle, may be so changed that fat, carbohydrates, and pure albumin are not, but Klemperer regards gelatin as a frequent source of oxalates. Uric acid is not changed into oxalic acid in the body, but it is possible that fermentation in the bowel may lead to the formation of oxalic acid.

Furthermore, oxalates are apparently formed in the body apart from the food supply. Lüthje found calcium oxalate in the urine of a fasting dog, and there is a transient increase in the amount of oxalic acid excreted during the stage of resolution of penumonia. Experimentally Rosenqvist has produced oxaluria by the destruction of the red blood-cells by the injection of pyrogallic acid. Klemperer is of the opinion that part of the oxalic acid excreted comes from the metabolism of the resorbed bile, as in the bowel glycocoll is formed from glycocholic acid.

The arrangement of a diet to cure or to prevent oxaluria becomes clear upon a consideration of the foregoing statements. In the first place, the amount of oxalic acid and oxalic-acid-forming foods taken into the body must be diminished or cut off altogether. This means forbidding fruits and vegetables containing large amounts of oxalic acid, chief of which are spinach, sorrel, rhubarb, and cabbage. Gelatin and meats containing many nuclei, as glands, should also be for-

bidden. The following tables give the oxalic-acid content of various foods:

Oxalic Content of Various Foods Re-arranged after Esbach's determinations, as quoted by Minkowski.

In 1000 grams.	Contained oxalic acid in grams.	In 1000 grams.	Contained oxalic acid in grams.
Cocoa	4.5	Carrots	0.03
Black Tea	3.7	Rose Cabbage	0.02
Sorrel	3.6	Celery	0.02
Pepper	3.2	Cress	Traces
Spinach	3.2	Apples	"
Rhubarb	2.4	Rice	Doubtful
Gooseberries	0.13	Lentils	"
Bread crust	0.13	Peas	"
Plums	0.12	Green Peas	"
Figs (dried)	1.0	Turnips	"
Chocolate	0.9	Asparagus	"
Chicory	0.7	Lettuce	"
Potatoes	0.4	White Cabbage and cauliflower	"
Beets	0.4	Cucumbers	"
Beans	0.3	Mushrooms	"
Green Beans	0.2	Onions	"
Coffee	0.1	Leeks	"
Endives	0.1	Pears	"
Various flours	0–0.17	Apricots	"
Strawberries	0.06	Peaches	"
Tomatoes	0.05	Grapes	"
Bread	0.047	Melons	"

Oxalic-acid Content of some Animal Foods (Cipollina).

In 1000 grams.	Oxalic acid in grams.
Thymus	0.0115–0.0254
Liver	0.0064–0.0113
Spleen	0.018
Lungs	0.0115
Muscles	Traces.

The second indication is to lessen the absorption of oxalic acid from the alimentary tract by lowering the acidity. This should not be carried to the point of affecting the urine, and is usually accomplished by small amounts of Vichy or similar mineral waters. This second indication is of minor importance.

The third indication is to increase the solvent power of the urine

Comparison of Magnesium and Calcium Content of Various Vegetable Foods (Klemperer after von Liebig).

Food.	Ash in per cent. of Substances.	Magnesium in per cent. of the Ash.	Calcium in per cent. of the Ash.
Millet	5.1	25.8	
Cocoa	4.9	15.9	2.8
Cornmeal		14.9	6.3
Rice	0.67	13.4	0.8
Nut kernels		13.0	8.6
Wheat flour	2.3	10.9	2.2
Buckwheat		10.3	6.6
Barley	2.5	9.6	3.5

Food.	Ash in per cent. of Substances.	Magnesium in per cent. of the Ash.	Calcium in per cent. of the Ash.
Apples	0.27	8.7	4.0
Coffee extract	3.4	8.6	3.6
Peas	2.6	8.1	5.1
Rye flour	1.97	7.9	1.02
Oatmeal	2.3	7.0	3.0
Tea extract	3.1	6.8	1.2
Potatoes	5.0	2.5	0.8
Grapes	2.25	8.8	36.9
Cherries	0.4	5.5	7.5
Plums	0.31	4.7	4.9
Asparagus	6.4	6.3	15.9
Lemon juice	0.2	3.3	7.9
Bananas		8.8	12.5
Spinach	2.03	5.3	13.1
Savoy		2.9	27.9
Cauliflower	8.8	Trace	21.7
White cabbage	11.6	3.7	12.6
Kohl-rabi	8.9	2.3	10.2
Radish	6.4	3.5	8.8
Cucumbers	4.8	3.0	6.9
Gooseberries	0.4	5.8	12.2
Lentils	2.1	1.9	5.1
Beans	3.1	6.5	8.6
Schoten	0.7	6.3	7.8
Clover		4.8	36.1
Poppy seeds		9.5	35.1
Sorrel		8.3	31.6
Pears	0.4	5.2	7.9
Strawberries		Trace	14.2
Carrots	5.4	2.3	5.6

Amounts of Magnesium and Calcium Contained in a Centigram of Dried Substance (Klemperer after Bunge).

	Magnesium.	Calcium.
Beef	15.2	2.9
Albumin of hens' eggs	13.0	13.0
Woman's milk	5.0	24.3
Yolk of egg	6.0	38.0
Cows' milk	20.0	151.0

Fresh cows' milk contains 0.177 per cent. of calcium oxid and 0.02 grams of magnesium oxid in 100 ccm.

for calcium oxalate and so prevent its deposition. This is accomplished by increasing the fluid and so increasing the amount of urine excreted, and by increasing the acid phosphates, especially the magnesium salts, in the urine and diminishing the amount of lime salts. In the table the magnesium and calcium worth of various foods is given, and this table will be found of great practical value in arranging diet-lists. The foods containing more lime than magnesium are to be avoided, whilst the foods containing an excess of magnesium are to be chosen. This may also be aided by the administration of small doses of magnesium sulphate. Klemperer recommends about 2 grams (30 grains) a day, to be given over a long period of time. The acidity of the urine is also increased by the meat diet usually given in oxaluria.

The following diet-list will be found of service:

Allowable.—Meat or fish of any kind except glands.

Milk and eggs are excluded by Klemperer on account of their lime content, but Minkowski is of the opinion that small quantities are allowable. If the symptoms are pronounced they should be forbidden, and in any case used sparingly if at all.

Fat of any kind may be given except the yolk of an egg.

Stale bread and zwieback are the best carbohydrates, but rice, barley, and hominy may be given and all the legumes. Potatoes may be allowed. Apples are the best fruit.

Beverages.—Water, beer, and weak coffee may be given. Alcohol may or may not be given, according to the individual and circumstances. It neither increases nor diminishes the excretion of oxalic acid.

Avoid.—All glands, such as thymus, pancreas, liver, and the like. Gelatin, calves'-foot jelly, and similar dishes.

All fruits and vegetables containing much oxalic acid—as spinach, sorrel, rhubarb, cabbage, turnips, in a word all vegetables except the legumes.

Tea, chocolate, and cocoa.

All rich and indigestible pastries and cakes.

Indicanuria.—Underhill found that when gelatin was fed to a dog as the chief nitrogenous constituent of the diet, the urinary indican was greatly decreased, or if the indican was decreased by feeding the animal a diet poor in nitrogen, the subsequent administration of gelatin does not materially increase the output of indican. This might be used in the diet of patients with indicanuria. If otherwise permissible the nitrogenous food might be diminished and gelatin added to the diet instead. There have been no clinical reports on this subject.

Cystinuria.—Patients with cystinuria should live upon carbohydrates, and fats with the minimum amount of nitrogenous food. The protein may be reduced to 50 or 60 drams a day for an individual weighing 70 kilos.

Albuminuria is not, as a rule, caused by the ingestion of certain foods by healthy individuals. Some persons, however, possess the remarkable idiosyncrasy that egg-albumin, or even cheese or other articles of diet, may cause a temporary albuminuria. These cases are of unusual occurrence. (The student is referred to text-books on clinical diagnosis or internal medicine for information regarding the many causes of albuminuria.)

Too much stress is ordinarily placed on the presence of albumin in the urine. As Emerson has shown, the percentage of albumin is the best index as to the progress of a case of *albuminuria.* It must be borne in mind, however, that this may or may not be so of a case of nephritis. In acute nephritis the urine is a fairly accurate guide,

improvement in the kidney condition being usually indicated by a diminution of the albumin and of blood in the urine, and by an increase in the amount of urine excreted. In subacute conditions the same may hold true, whereas in chronic nephritis the variations in the amount of albumin are most untrustworthy guides as to the patient's condition. A mere change in the diet, whether from a meat to a milk diet, or any other decided change, may be followed by an increase in the amount of albumin for some days. There are also variations in the amount of albumin excreted that are due to influences not as yet understood.

Renal Tests.—There are numerous tests for renal function, most of which consider the elimination as a whole, but as Mosenthal and Lewis and others have pointed out the glomerule and the different subdivisions of the uriniferous tubules react differently to various substances and to the different extrarenal factors as fever, cardiac failure, etc. A kidney may retain water or salt or urea or phosphates or sulphates or any of the urinary constituents and the remainder may pass freely.

The phenolsulphonephthalein test is most frequently employed. (For the technic of these tests the reader is referred to the textbook on diagnosis.) Others that are employed are the estimation of the nonprotein nitrogen of the blood, the estimation of the urea of the blood, Ambard's coefficient of urea excretion and the test meal for renal function. The following tables of Mosenthal and Lewis (Journal of the American Medical Sciences, September 23, 1916, vol. lxvii, p. 933) illustrate the findings in various degrees of loss of kidney function. In addition water and salt and lactose tests may

Scale of Degree of Impairment of Renal Function as Indicated by the Tests Employed. (Mosenthal and Lewis.)

Degree of Impairment of Renal Function.		Phenolsulphonephthalein, per cent.	Nonprotein N of the Blood, Mg. per 100 C.c.	Urea N of the Blood, Mg. per 100 C.c.	Ambard's Coefficient of Urea Excretion.
Normal	0	60+	30—	15—	0.090—
Slight	+	59-40	31-45	16-27	0.091-0.115
Moderate	++	39-25	46-65	28-44	0.116-0.220
Marked	+++	24-11	66-90	45-64	0.221-0.350
Maximal	++++	10- 0	91+	65+	0.351+

Test Meal for Renal Function.

		Night Urine.		Variations in Sp. G. when the Highest Sp. G. is:			
		C.c.	Sp. G.	18	17–15	14 and 13	12 —
Normal	0	400—	18+	9+			
Slight	+	401-600	16 and 17	8—5	6+		
Moderate	++	601+	15—	4—	5 and 4	6+	
Marked	+++	......	....	......	3—	4 and 5	6+
Maximal	++++	......	....	......	......	3—	5—

be used. The interpretation of findings is often difficult as there may be many extrarenal factors to consider and they should always

be taken into account and the experienced clinician will watch his patient closely and not depend too much on the results of the various tests. The kidney, like the other organs, is furnished with a large factor of safety so that considerable impairment may be present before these tests for renal insufficiency show up in the urine, so that the early states will depend for diagnosis and treatment on the older methods of blood pressure, ordinary urinary findings, clinical history and the like.

The earlier clinical studies were made with reference to the anatomic changes in the kidney. At first it was hoped that the renal function tests might correlate the anatomic and clinical findings, but this has not been the case and even the most sanguine students do not hope to be able to determine the anatomical changes. The kidney may be but little changed anatomically and yet show marked functional disturbance and conversely. The chief value of the tests is in prognosis, but even then they have not been used sufficiently long to enable one to make any very dogmatic statements. In this regard the tests are of most importance in the chronic interstitial nephritis cases with marked vessel changes. Even in these cases there are many atypical findings.

The phenolsulphonephthalein test of Rowntree and Geraghty consists of the injection of 1.0 c.c. of a solution of the dye intramuscularly and the determination by simple methods of the amount excreted in the first two hours. Normally this should be 60 per cent. or over and if it falls below this the renal function is impaired. (See Mosenthal and Lewis' table.) McLean has shown that the output practically parallels the urea index except where the patients have cardiac insufficiency and are not excreting sufficient water.

Another type of test consists in examining the blood, usually for the nonprotein nitrogen and the urea nitrogen, sometimes for uric acid and creatinin. The normal products of metabolism circulate in the blood and are excreted by the kidney so that more or less definite percentages are in the blood. If the kidney is impaired they may accumulate in the blood, but they may also accumulate owing to disturbances of metabolism in which the waste is abnormally high or normally when the individual is taking a diet rich in nitrogen. The normal limits are still a question of investigation. The upper normal limit is usually placed at 30 mg. of nonprotein nitrogen in 100 c.c. of blood. As high as 44 mg. have been found in supposedly normal individuals.

The urea nitrogen limit seems to be about 15 mg. per 100 c.c. of blood, with some variations.

Both of the above are subject to variations according to the diet of the patient, so that a standardized diet is best used. In order to get more accurate information Ambard suggested the study of the

amount of urea in the blood and the amount excreted in the urine in a given space of time. This relation is usually spoken of as the Ambard coefficient and the formula is as follows:

$$K = \frac{Ur}{\sqrt{D \times \frac{70}{P} \times \frac{\sqrt{C}}{\sqrt{25}}}}$$

In which K = The coefficient of urea excretion.
Ur = Urea grams per liter of blood.
D = Urea grams excreted in urine in twenty-four hours.
C = Urea grams per liter of urine.
P = Body weight in kilograms.
70 = Standard body weight in kilograms.
25 = Standard concentration of urea grams per liter of urine.

The normal coefficient ranges from 0.06 to 0.09. The significance of the changes is shown in the table. McLean suggests using what he calls the urea index. With the normal relation expressed as 100, the figures are more easily remembered, but it complicates the literature. As we have seen the Ambard coefficient and the phenolsulphonephthalein tests run sufficiently close for practical purposes. The other tests can only be carried out in a hospital with good laboratory facilities. For the present they will be confined to hospital and research work. These tests all need much further investigation, but show the trend of modern thought in regard to the problem of nephritis.

Another test of greater practical significance has been put into practice by Hedinger and Schlayer and in this country by various workers among whom may be mentioned Mosenthal and Christian. This test consists of putting the patient on a standardized fluid intake and on a standard diet. No food or fluid is taken except as indicated in the diet lists for testing renal function given below. The urine is collected every two hours during the day and a night specimen of some 10 to 12 hours. In normal persons the quantity of night urine is small, 400 c.c. or less, and of a specific gravity of from 1.018 or over. The day urine is 1.018 or over and varies nine points or more from the highest to the lowest. (See table.) When the renal function is impaired the maximal specific gravity is lowered, the specific gravity may be fixed and there is an increase in the amount of night urine. This test is more liable to show low grades of impairment than the others.

The sodium chloride and nitrogen excretion may be studied at the same time and the management of the diet directed according to the findings. If sodium chloride is not excreted well it should be diminished. The nitrogen intake should be kept within the limits of the patient's ability to utilize it and excrete the end products. Eventually the point may be reached where simple methods will indicate the amounts of phosphates, sulphates, etc., that the patient can use to the

best advantage, and diets arranged accordingly. This time, as far as the general practitioner is concerned, is far off and for the present the greater part of the patients of nephritis must needs depend on the skill of the clinician for the regulation of their diet rather than the laboratory lists.

Salt Test.—The average diet contains about 10 to 12 grams sodium chlorid and an equal amount may be ingested and be excreted in twenty-four hours. The ability of the kidney to concentrate the salt in solutions may be affected in some kidney diseases and if much salt is given it is retained in the body. The salt test should be used with great caution in nephritis, particularly the acute cases. The patient is put on a constant diet with a constant water intake. From 5 to 10 grams of sodium chlorid are given, usually in the morning. The amount excreted is determined, the concentration estimated and the total amount of urine measured.

Water Intake and Test.—In health about two-thirds of the daily intake of water is excreted through the kidneys, the remainder being excreted through the lungs, bowels, or skin. The water passes through the glomeruli. Normally the excretion follows the fluid intake, but in disease there may be either polyuria or oliguria or even anuria. Oliguria presupposes a more marked glomerural change than polyuria. There are many factors outside the kidney which influence water excretion, but the kidney is the regulating organ. The specific gravity fluctuates, but the fluctuations are less in diseased conditions. The kidney also possesses the power to concentrate the urine so that even if the water intake is small the solids excreted in the urine are sufficient to keep the body free from waste products. In some diseased conditions the kidney loses this function and the specific gravity may not exceed 1.012. The excretion of solids may not always be sufficient to keep the body free from the waste products unless the amount of water ingested is increased. Various tests have been suggested, all of which should be judged with a knowledge of the salt intake, the amount of sweating, the occurrence of diarrhea, and the amount of moisture in the air. Volhard and Fahr give 1500 to 2000 c.c. water in one hour. Normally this is all excreted in the next twenty-four hours, together with the usual amount and in the first half hour succeeding the ingestion 500 c.c. are excreted.

Cottet gives the following test:

6.30 to 7.00 A. M.—600–800 c.c. water.
9.00 A. M.—a light breakfast and 250 c.c milk.
Noon—a light meal and 400 c.c. liquid.
7.00 P. M.—a light meal and 400 c.c. water.
Collect urine 7 A. M. to 9 P. M. and from 9 P. M. to 7 A. M.
In normal conditions three times as much urine is passed in the day as at night. In disease the night and day excretion may be equal or nearly so.

Various test diets have been devised for testing the renal function

and we reproduce below one constructed by Mosenthal and used in his clinic in the Johns Hopkins Hospital. We have also given a low protein test diet and a couple simple low protein dietaries for ordinary use.

Renal Function Test Diet—Mosenthal.

For .... Date ....

All food must be *salt free* food from the diet kitchen.

Salt for each meal will be furnished in weighed amounts.

All food or fluid not taken must be weighed or measured after meals and charted in the spaces below.

Allow no food or fluid of any kind except at meal times.

Note any mishaps or irregularities that occur in giving the diet or collecting the specimens.

Breakfast, 8 A. M.	
Boiled oatmeal—100 gms.	....
Sugar—½ teaspoonful.	....
Milk—30 c.cm.	....
2 slices bread (30 gms. each).	....
Butter—20 gms.	....
Coffee—160 c.cm. } —200 c.cm.	....
Sugar—1 teaspoonful }	....
Milk—200 c.cm.	....
Water—200 c.cm.	....
Dinner, 12 Noon.	
Meat soup—180 c.cm.	....
Beefsteak—100 gms.	....
Potato (baked, mashed or boiled) —130 gms.	....
Green vegetables, as desired	....
2 slices bread (30 gms. each)	....
Butter—20 gms.	....
Tea—180 c.cm. }	....
Sugar—1 teaspoonful } —200 c.cm.	....
Milk—20 c.cm. }	....
Water—250 c.cm.	....
Pudding (tapioca or rice)—110 gms.	....
Supper, 5 P. M.	
2 eggs, cooked in any style	....
2 slices bread (30 gms. each)	....
Butter—20 gms.	....
Tea—180 c.cm. }	....
Sugar—1 teaspoonful } —200 c.cm.	....
Milk—20 c.cm. }	....
Fruit (stewed or fresh)—1 portion	....
Water—300 c.cm.	....

8 A. M.

No food or fluid is to be given during the night or until 8 o'clock the next morning (after voiding), when the regular diet is resumed.

Patient is to empty bladder at 8 A. M. and at the end of each period as indicated below. The specimens are to be collected for the following periods in properly labeled bottles, to be furnished:

8 A. M.–10 A. M.; 10 A. M.–12 N.; 12 N.–2 P. M.; 2 P. M.–4 P. M.; 4 P. M.–6 P. M.; 6 P. M.–8 P. M.; 8 P. M.–8 A. M.

Specimens are to be left in ward until called for at 8.30 A. M. by attendant from the Chemical Laboratory.

Low Protein Test Diet for Renal Function.

For .... Date ....

All food is to be "Low Protein" food from the diet kitchen.

Salt for each meal will be furnished in weighed amounts.

Allow no food or fluid of any kind except at meal times.

Note any mishaps or irregularities that occur in giving the diet or collecting the specimens.

All food or fluid may be taken in any quantity desired but must be weighed or measured and charted in the spaces below:

Breakfast, 8 A. M.

Hominy cornstarch ....
Cream ....
Sugar ....
Fruit (state kind) ....
Butter ....
Water ....

Dinner, 12 Noon.

Potato (state whether baked, mashed or boiled) ....
Vegetable (state kind) ....
Vegetable (state kind) ....
Vegetable (state kind) ....
Olive Oil ....
Vinegar ....
Butter ....
Pudding (state whether cornstarch or tapioca) ....
Sugar ....
Fruit (state kind) ....
Water ....

Supper, 5 P. M.

Potato (state whether baked, mashed or boiled) ....
Vegetable (state kind) ....
Vegetable (state kind) ....
Vegetable (state kind) ....
Olive Oil ....
Vinegar ....
Butter ....
Pudding (state whether cornstarch or tapioca) ....
Sugar ....
Fruit (state kind) ....
Water ....

8 A. M.

No food or fluid is to be given during the night or until 8 o'clock the next morning (after voiding), when the regular diet is resumed.

Patient is to empty bladder at 8 A. M. and at the end of each period, as indicated below. The specimens are to be collected for the following periods, in properly labeled bottles, to be furnished by the Chemical Division of the Medical Clinic:

8 A. M.–10 A. M.; 10 A. M.–12 N.; 12 N.–2 P. M.; 2 P. M.–4 P. M.; 4 P. M.–6 P. M.; 6 P. M.–8 P. M.; 8 P. M.–8 A. M.

Specimens are to be left in ward until called for at 8.30 A. M. by attendant from the Chemical Laboratory.

The following are actual tests of renal function made by Mosenthal:

Test of Renal Function (Mosenthal).

			NaCl.		N.	
Time of Day.	C.c.	Sp. Gr.	Per cent.	Gm.	Per cent.	Gm.
8–10	430	1007	0.32	1.38	0.26	1.12
10–12	320	1008	0.52	1.66	0.34	1.09
12–2	285	1009	0.42	1.20	0.37	1.05
2–4	250	1010	0.48	1.20	0.49	1.23
4–6	156	1013	0.52	0.86	0.61	0.95
6–8	365	1005	0.20	0.73	0.33	1.20
Total day	1806	....	....	7.03	....	6.64
Night, 8–8	295	1021	1.06	3.13	1.11	3.27
Total, 24 hours	2701	....	....	10.16	....	9.91
Intake	1760	....	....	8.50	....	13.40
Balance	— 341	....	....	— 1.66	....	+ 3.49

Impression: Normal result. Note the increased specific gravity and high concentration of salt and nitrogen in the night specimen. The polyuria and low concentration of the day specimens may be due to the excess of candy which the patient is in the habit of taking.

Test of Renal Function (Mosenthal).

			NaCl.		N.	
Time of Day.	C.c.	Sp. Gr.	Per cent.	Gm.	Per cent.	Gm.
8–10	385	1007				
10–12	112	1014				
12–2	178	1013				
2–4	136	1015				
4–6	176	1015				
6–8	226	1009				
Total day	1213	....	0.34	4.12	0.55	6.67
Night, 8–8	622	1013	0.58	3.61	0.58	3.61
Total, 24 hours	1835	....	....	7.73	....	10.28
Intake	1760	....	....	8.50	....	13.40
Balance	— 75	....	....	+ 0.77	....	+ 3.12

Impression: Low specific gravity (maximum 1015 instead of a normal of 1018). Variation of specific gravity is 8 degrees (normal 9 degrees). A slight but distinct nocturnal polyuria. A moderate impairment of renal function.

Test of Renal Function (Mosenthal).

			NaCl.		N.	
Time of Day.	C.c.	Sp. Gr.	Per cent.	Gm.	Per cent.	Gm.
8–10	77	1012				
10–12	85	1011				
12–2	69	1013				
2–4	71	1012				
4–6	61	1011				
6–8	80	1011				
Total day	443	....	0.24	1.06	0.50	2.22
Night, 8–8	595	1010	0.25	1.48	0.42	2.49
Total 24 hours	1038	....	....	2.54	....	4.71
Intake	1610	....	....	6.50	....	12.00
Balance	+ 572	....	....	+ 3.96	....	+ 7.29

Impression: Marked fixation of the specific gravity at a lo level. A maximal impairment of renal function.

THE JOHNS HOPKINS HOSPITAL.

Low Protein Diet.

Breakfast: Sherry, 30 c.cm.
Baked apple, stewed prunes, orange.
"Hominy Cornstarch Cereal."[1]
Cream, 15 c.cm.

Dinner: Sherry, 30 c.cm.
Potato, baked or mashed.
String beans, cabbage, carrots, lettuce, onions, tomatoes, cucumber pickles.
Fruit cornstarch pudding, fruit tapioca pudding.

Supper: Same as dinner.
Weigh or measure all foods eaten except salt, sugar and butter, which may be used as desired, and need not be weighed.

Special Diet for Nephritis. (Mosenthal.)

Nitrogen Content of Foods used in Low Protein Diet.

	Article of Food.	*Percentage of Nitrogen.*
	Cream	.41
Cereal:	[1] "Hominy Cornstarch"	.13
Fruit:	Baked apple	.04
	Orange	.16
	Stewed prunes	.14
Vegetables:	Cabbage	.16
	Carrots	.10
	Lettuce	.24
	Onions	.17
	Cucumber pickle	.10
	Baked potato	.48
	Mashed potato	.40
	String beans	.23
	Tomatoes	.23
Desserts:	Blackberry cornstarch pudding	.05
	Prune cornstarch pudding	.07
	Apple tapioca pudding	.02
	Peach tapioca pudding	.06

[1] $\frac{2}{3}$ hominy, $\frac{1}{3}$ cornstarch.

Breakfast—6 A. M.
Coffee or cocoa—4 oz. with milk or sugar.
Orange—1.
Rice or oatmeal cooked without salt.

10 A. M.
Milk—4 oz., or cocoa—6 oz.
Salt free toast.
Orange—1,—if desired.

Dinner.
Small amount of any green vegetable or tomato cooked without salt.
Egg—1,—as desired, without salt.
Salt free toast—2 slices.
Custard—rice or sago.
Pudding.

4 P. M.
Milk—6 oz.
Orange—1,—if desired.

Supper.
Salt free toast—2 slices.
Egg—1, as desired, without salt.
Tea—6 oz., with milk or sugar, if desired.
Baked apple or stewed fruit.

The Fluid Intake.—This is always a vexing problem and every case must be individualized. As long as the water is not being ex-

creted the amount should be kept down. From one to one and a half liters a day being the amounts usually given to relieve the intense thirst. As the patient improves the excretion becomes more free and the edema may disappear entirely or almost so. In these cases, as well as in those in which the excretion of water is not particularly reduced, more fluid may be allowed. Alkaline mineral waters, such as Celestins vichy may be used, particularly if there is any acidosis.

In addition to the question of protecting the kidney by avoiding irritating foods, one should limit the work of the kidney by seeing that the elimination by way of the skin is free, and by purging and so making use of the eliminating faculties of the bowel. The avoidance of physical and mental strain should also not be forgotten. The times of taking food should be carefully regulated and also the amounts, the quantity taken at any one feeding being limited. Great care should be taken not to over-feed the patient. On the other hand, care should be taken not to have him on an insufficient diet. The diet should be arranged with reference to the weight of the patient, care being taken to see that sufficient calories are given to cover the theoretic needs. These will be found under the heading the "Total Food Requirements." Having determined the number of calories the amount to be given in protein food should be estimated. Chittenden has shown, as noted elsewhere, that perfect health may be maintained and a nitrogen balance established on a minimum requirement as low as 60 or 70 grams of protein daily for a patient weighing 70 kilos. This amount or whatever the patient is able to manage as shown by tests, should be chosen, first avoiding all the proteins that contain much purin nitrogen. The remainder of the diet can be then made up from carbohydrates and fats, taking great care to scrutinize the articles of food with reference to not only their nitrogen content, but the amount of sodium chlorid which they contain. Under the heading of the "Salt Free Diet" a very extensive list will be found showing the percentage of sodium chlorid and nitrogen in the various foods in ordinary use.

Diet with Reference to Base and Acid-forming Foods.—It has been suggested that both in nephritis and high blood-pressure the diets be so arranged as to keep the hydrogen ion concentration at pH7 or more. This may readily be accomplished by arranging the diet from alkaline-producing foods and reducing or omitting those which add to the acid content of the body. Tests of foods with reference to acid and base content will be found under that heading elsewhere in this volume.

Acidosis.—This is best combated in acute nephritis by the administration of alkalies, either by mouth or by the Murphy drip, and sodium bicarbonate is as satisfactory as anything. Sometimes in very severe cases the alkalies are administered intravenously and Fischer has advised using 14 grams of sodium chlorid and 10 to 20 grams of sodium carbonate (crystalline) to a liter of water. Rowntree and

others have used this fluid, substituting sodium bicarbonate up to 4 per cent. This is sterilized in tightly stoppered bottles in an autoclave for twenty minutes and a little free bicarbonate is scattered in the autoclave. In sterilizing the bicarbonate is changed to the carbonate and this may be transformed by passing carbon dioxid through the fluid under aseptic precautions, a few drops of phenolphthalein being added as an indicator.

THE DIET IN NEPHRITIS

Of great value in general practice is the study of the patient's general condition, the blood-pressure and the simple tests of the urine. The points of particular interest as regards the diet are the presence or absence of albumin and casts, increase or decrease in the amount in twenty-four hours, the presence of nycturia, arising at night to pass the urine, hyposthenuria, a condition where the kidney can no longer concentrate the urine, the twenty-four hour specimen being of the least specific gravity, usually not over 1.012, and lastly the presence or absence of hematuria.

From the standpoint of practical diet nephritis may be divided into three groups: the acute cases, chronic parenchymatous nephritis, and chronic interstitial nephritis. The old dictum of Traube: "protect the kidneys and control the heart," sums up the subject very well. One of the first principles in the dieting of patients with any disease of the kidney is to avoid giving substances that are injurious to the renal epithelium. Many injurious articles of diet are known by the fact that they uniformly produce bad effects. A second group founded on studies of metabolism has been added by von Noorden and others. He ascertained which end products were easily excreted and which with difficulty and advised the avoidance of broken up end products that are difficult of excretion. The patient should be carefully protected from lead and other poisons and all the substances forbidden in gout are forbidden in nephritis. In the first group are included grills and roasts, especially the brown outer surface of these, strong sauces, pastry, spices and condiments of all kinds, very acid foods, and strong alcoholic drinks. The use of tea and coffee should be scrutinized with the greatest care and many cases do better without either. The following list shows the substances that are excreted with ease or with difficulty in acute, subacute and in the exacerbations in chronic nephritis:

Excreted with Difficulty.	*Easily Excreted.*
Urea.	Uric acid.
Creatinin.	Xanthin bases.
Pigments.	Aromatic substances.
Hippuric acid.	Amido-acids.
Phosphates.	Carbonates.
Inorganic sulphates.	Water (see below).
Potassium salts.	
Water (see below).	

Early in the disease water is excreted with great difficulty—with more difficulty than even urea. As soon as improvement sets in, however, it is easily gotten rid of. The difficulty probably lies in the mechanical interference with its excretion, owing to the great distention of the blood-vessels caused by the severe congestion.

It is necessary next to notice briefly the articles of diet that give rise to the different end-products just mentioned.

Creatinin is derived from creatin, which is present in meat-extracts and in meat broths. Traces are also found in the white and in yolk of eggs and in meat. It is not present in vegetables.

Urinary Pigments.—Little is known concerning these. They are all probably derived from hemoglobin, and there is no way of controlling hemoglobin metabolism by restricting the diet. Substances containing homoglobin may, however, be omitted from the diet.

Phosphoric Acid.—This is present in large quantities in meat, yolk of eggs, milk, and many vegetables. Milk is the principal food to be considered here, as it is used extensively and contains large quantities of the acid. Von Noorden suggests the use of calcium carbonate to overcome this acidity in the patients on a milk diet.

Urea and Sulphates.—These are both derived from albumin. The important point to remember is the fact that the amount of protein ingested may be reduced to a very small quantity if, at the same time, corresponding quantities of carbohydrates and fat are administered. Von Noorden gives about a liter and a half of milk daily, and usually adds a quarter of a liter of cream to it. He warns against the excessive use of fat in nephritis. Amylaceous soups or gruels are added to the diet where necessary.

Hippuric Acid.—This is derived from compounds (benzoic esters) that are contained in green vegetables, fruits with kernels, and cranberries. These should be avoided in acute inflammatory processes in the kidneys. Small quantities are, however, found in such fruits as pears, apples, and many berries, particularly raspberries, and in grapes. These fruits and juices made from them may be given in nephritis.

Acetic Acid and Citric Acid.—Von Noorden[1] says: "There is an old popular prejudice to the effect that acetic acid should be altogether eliminated from the diet of patients suffering from renal disease, from lithiasis, and from bladder troubles." Citric acid as contained in lemon-juice has been recommended as a substitute for acetic acid. Von Noorden states that there is no theoretic or practical objection to the use of vinegar in diseases of kidney, bladder, or urethra, and that he has never seen the slightest harm result from its use.

Uric Acid and the Xanthin Bases.—These are relatively well excreted. They are, however, toxic, and under certain conditions their

[1] Von Noorden, *Clinical Treatises on the Pathology and Therapy of Disorders of Metabolism and Nutrition,* Part II, Nephritis.

elimination may be retarded. In all forms of nephritis it is, therefore, advisable to withhold all such foods as favor the formation of alloxuric bodies. These are all animal tissues rich in nuclein,—especially glands,—such as sweetbreads, liver, spleen, kidney, and strong meat broths.

Muscle meat, of course, contains some nuclein, but not sufficient to justify its exclusion from the diet on these grounds.

Von Noorden and others have determined, as the result of careful experimentation, that there is no difference in the light and dark meats as regards the effects of their end-products on the kidneys. This is in direct variance with the time-honored view, but it is apparently based on uncontrovertible facts.

Alcohol.—Little is known in regard to the excretion of alcohol by diseased kidneys. Alcohol, whether taken in the form of the strong or of the weaker alcoholic beverages, is known to act as one of the worst of poisons to the kidneys. That it irritates the kidneys directly, there can be no doubt; but it is also true that a certain amount of alcohol will be eliminated by healthy kidneys without harm to them. This amount probably varies with different individuals and can not be definitely fixed. The amount that will prove injurious to diseased kidneys is undoubtedly smaller than for healthy kidneys. Ordinarily, alcohol should be strictly avoided, but there are cases in which it may be used with great benefit. Attacks of cardiac weakness and a small, thready pulse may be successfully combated by small, repeated doses. In certain cases where there is nausea, food may be retained when small quantities of wine or diluted brandy or whisky are given.

Alcohol is contained in kefir and kumiss, which are used in large quantities by physicians who would not prescribe it in any of the stronger forms.

Acute Nephritis.—There is still considerable difference of opinion concerning the best diet for patients with this disease.

(a) In Severe Cases where Secretion of the Urine is Greatly Reduced. In these cases where the edema is increasing and where uremia threatens, the amount of food and drink should be limited to the smallest possible amount. If there is vomiting, all food should be withdrawn until it subsides. If there is an accompanying acidosis it will have to be dealt with according to the suggestions made under that heading. If the patient is not excreting all the fluid added to the body is retained and increases the difficulty. If the thirst is intense, water, in tablespoonful doses, may be given, or what is usually better, ice may be given to quench the thirst. The surplus water in the tissues may be removed by sweating or purging. When the heart is failing and the pulse is small and thready, brandy or whisky may be administered in small, frequent doses. If the patient is not vomiting, about one pint of fluid food may be administered, preferably

in the form of a gruel made out of rice or barley flour or corn or wheat flour may be substituted or even potato starch. Small amounts of fruit juices may be allowed with this.

Such a diet cannot be maintained ordinarily for more than four or five days without seriously impairing the strength, but usually at the end of this time the patient is either improved or succumbs to the disease. It was formerly suggested to use milk in similar quantities. This would seem to entail rather more work on the kidney. As the patient improves and passes into the second class:

(b) The Cases in which the Excretion of Water is Reduced, but in which Anuria does not Threaten Life. In these cases, as the patient improves, the diet can be gradually increased. For the first week or two the protein may be kept at a minimum by using the gruels or purées mentioned above to which may be added fruit, particularly those that are rich in sugar, fruit juices, such as orange juice, grape juice or other fruit syrups; crackers or zwieback may also be given and washed, unsalted butter. As soon as the acute symptoms have passed milk and cream may be added to the diet. At this time 1500 grams of milk, 375 grams of cream, 50 grams of rice, 50 grams of zwieback, 50 grams of butter, 20 grams of sugar, with a total value of 2900 calories, might be utilized.

Some authorities suggest a strict milk diet but it would seem a more rational treatment to replace as much of the milk as possible by the carbohydrates and fats. As the patient improves the diet may be increased and easily kept from becoming monotonous by using the various cereals, adding bread and various dishes, such as are made out of arrowroot or cornstarch, which may be flavored with fruit juices, orange juice, or lemon or grapefruit juice to which lactose has been added and junkets and custards. If the digestion is very good the butter and other fats may be increased and later the more easily digested vegetables may be added, and as convalescence is established, spinach and cauliflower tops and peas and other such things may be used to introduce variety.

As to beverages, water, plain or carbonated, mineral waters, fruit-juice and water (lemonade, etc.). If the patient prefers milk, from four to seven pints may be given daily, diluted with a carbonated water. If it causes diarrhea, lime-water should be added to the milk, or if there is constipation, magnesia solution or citrate of magnesia may be given instead. If symptoms of indigestion appear, the milk may be skimmed, or buttermilk substituted. If the stomach becomes disordered, kumiss may be given in place of milk, or rice, or barley, or arrowroot gruel may be substituted for it. If vomiting occurs, the stomach should be given complete rest, after which carbonated water may be allowed. A favorite drink under these conditions, or in fact at any time in the course of an acute nephritis, is the imperial drink, made by dissolving a dram of cream of tartar in a pint

of boiling water and adding the juice of half a lemon and a little sugar; this should be given cold.

If the course of the disease is slow and the condition subacute, the diet must be increased or the patient's strength will fail. In these cases small amounts of meat may be added to the dietary. The effect on the urine and temperature must be carefully watched. If there is marked disturbance, the meat should be discontinued and then repeated after several days. The general condition of the patient is a safe guide, and he must not be allowed to starve to death because a small amount of albumin appears in his urine.

Blackfan suggests the use of a 2 per cent. solution of magnesium sulphate for the relief of cerebral symptoms of acute nephritis. A 2 per cent. solution of sulphate of magnesia is injected intravenously at the rate of 10 c.c. per minute and given in the amounts of 15 c.c. per kilogram of body weight. Following the injection there is a fall of the blood-pressure, relief of the cerebral symptoms, and lessening of the edema. The blood-pressure falls, and as a result there is abatement of headache, visual disturbances, convulsions, and vomiting. The dehydrating effect is manifest by diuresis, diaphoresis, or by catharsis. This elimination is followed by prompt improvement in the kidney excretion and other body functions. In decompensation of the heart the blood-pressure was not altered following the intravenous injection. The day following the first injection there may be a rise in the blood-pressure and the injection can be repeated. The solution may be injected every day or every other day until the blood-pressure reaches a low level, this usually occurring after three to four injections.

Chronic Parenchymatous Nephritis.—In this disease the patient's mode of life must be carefully regulated. The amount of exercise and rest and the time to take the meals and the quantity require particular attention. The general principles outlined above hold good in these cases. The first point should be to avoid all irritating articles of food, the second to supply protein just sufficient to cover the patient's needs and the deficiency in the number of calories required is to be made up by suitable carbohydrates and fats. Care should be taken in the severer cases not to starve the patient. No hard and fast rule can be laid down as to the restriction of protein, but every case should be dealt with according to the particular requirements. Where the physician has access to suitable laboratory facilities, tests of the renal function made from time to time show whether the case is progressing or getting worse, and the diet can be arranged accordingly.

The protein can be kept at a low amount for very long periods of time if care is taken not to try to get the amount below what is actually required to prevent nitrogen loss. A protein-free day every now and then is often of value and in the exacerbations which often

occur, the protein may be cut in half until the acute symptoms subside. Milk, buttermilk, and the other foods made from milk are very generally used to supply a part of the protein, but care should be taken not to insist on too much milk, inasmuch as sooner or later the patient will become extremely tired of it. If the patient stands it well, and they usually will, one-half of the protein may be given in the form of fresh meat or fresh fish. Eggs or vegetables may be used as a substitute for part of this. By so doing a palatable and, at the same time, a satisfactory diet can be easily arranged. Peas and beans may be used and the carbohydrate part of the diet made up from the various cereals and fruits that have already been suggested. Fats are best given in the form of cream or butter. Sugar, fruit syrups, jellies and compotes may be given, using especially apples, pears, or raspberries. Sago and tapioca, arrowroot and cornstarch should not be forgotten as furnishing satisfactory materials for desserts. The various infant's and invalid's foods may also be used. Tea and coffee in small amounts are generally allowable; alcohol is prohibited, except as needed in special cases.

The fluid intake will depend upon the individual. If there is edema the amount should be limited to from one to one and a half liters a day, or if the edema is marked smaller amounts may be used until the water excretion increases.

The amount of salt allowed will have to be regulated according to the patient's ability to excrete it. Where there is edema the amount should be cut down to a minimum, using the foods from the lists given under the Salt-free Diet. Very often salt is withheld unnecessarily long and the salt elimination may be tested from time to time by adding small amounts to the diet and noting changes that take place in the urine or excretion and the thirst as to whether edema is produced. (See also Salt-free Diet and the Karell Diet.)

Nephrosis.—Chronic parenchymatous nephritis includes a number of widely differing kidney lesions which, from the standpoint of practice at present, there is little need for separating. There are, however, certain cases of what has been called nephrosis and certain cases of diffuse nephritis occurring in relatively young women during or after pregnancy and in older diabetics, which have been studied by Epstein (American Journal of the Medical Sciences, November, 1917, p. 638). In these cases the total blood protein is low and there is a relative increase in the globulin content. Sometimes it makes up nearly all of the nitrogenous matter of the blood. There is an increase of the fats and lipoids in the blood. The urine usually has a high specific gravity, is deficient in chlorides, and very high in albumin. In nephrosis the formed blood elements are not found in the urine and the blood pressure is not elevated. In the chronic diffuse nephritis the blood pressure may be very high. The enormous protein loss in the urine is the important thing. Epstein

recommends a marked innovation, that of increasing the proteins, eliminating the fats, and limiting the carbohydrates, the last to promote a maximum assimilation of the proteins and to limit the water retention.

Diet employed:	*Daily amount.*
Food value	1280–2500 calories
Proteins	120–240 grams
Fats (unavoidable)	20–40 grams
Carbohydrates	150–300 grams

Articles used: lean veal, lean ham, whites of eggs, oysters, gelatin, lima beans, lentils, split peas, green peas, mushrooms, rice, oatmeal, bananas, skimmed milk, coffee, tea, cocoa.

The fluid is restricted to the amount needed to make the patient comfortable, generally 1200 to 1500 c.c. Salt is allowed sufficient to make the food palatable. From a small number treated Epstein has had good results, if somewhat slow of accomplishment. The blood gradually returns to normal, the amount of urine excreted increases and the edema gradually disappears. The albuminuria decreases and the general health improves. Bleeding (500 c.c.) and replacing by transfusion may be used in connection with this treatment. Newburgh (Archives of Internal Medicine, 28, 1, July, 1921, and Jour. Amer. Med. Assoc., 79, 1106, September 30, 1922) has; however, called attention from experimental evidence both in animals and man that excesses in high protein diets will rapidly produce renal injury. According to this investigator, long-continued abuse in protein produces a locus minoris resistential of the kidney structure, which, in turn, renders this organ less resistant to infection. It is a well-observed fact that chronic nephritis is rather rare among inhabitants of the tropics, but frequent in temperate climates. Newburgh suggests that this may in part be due to the fact that Europeans and North Americans are accustomed to consume far more protein food in the form of meat than the tropical races.

Acute Nephritis Due to Mercuric Chlorid.—Lambert and Patterson (Archives of Internal Medicine, 1915, xvi, 871) have outlined the treatment of these cases as follows:

"1. The patient is given every other hour 8 ounces of the following mixture: Potassium bitartrate, 1 dram; sugar, 1 dram; lactose, one-half ounce; lemon juice, 1 ounce; boiled water, 16 ounces. Eight ounces of milk are administered every alternate hour.

"2. The drop method of rectal irrigation with a solution of potassium acetate, a dram to the pint, is given continuously. The amounts of urine secreted under this treatment are very large. In one case, 269 ounces were passed in twenty-four hours on the fourteenth day of treatment.

"3. The stomach is washed out twice daily.

"4. The colon is irrigated twice daily, in order to wash out whatever poison has been eliminated in that way.

"5. The patient is given a daily sweat in a hot pack.

"It is imperative to emphasize the necessity of keeping up the treatment with the colonic drip enteroclysis day and night without interruption. It entails discomfort for the patient, but the victims of accidental poisoning are always willing to do anything to recover from their plight, and the attempted suicide usually repents rapidly of his error, and the hope of his life being saved stimulates his patience and desire to coöperate.

"In cases in which one single dose has been taken, after two negative examinations of the urine, on successive days, it seems legitimate to stop the treatment. For the less severe cases, a week may be a sufficient time for treatment. When large or successive doses have been taken, or when there is a preëxisting kidney lesion, or when treatment begins several days after the poison is taken, longer periods of treatment, up to two or three weeks, are necessary."

Rosenbloom (Amer. Jour. Med. Sci., 157, 355, March, 1919) suggests the following method of treatment:

1. Administer the whites of three eggs beaten up in a quart of milk, and then empty the stomach by siphonage.

2. Give 300 c.c. of fresh calcium sulphid solution, containing 1 grain to 1 ounce of water by mouth.

3. Wash out the stomach with fresh calcium sulphid solution, 1 grain to 1 ounce of water.

4. Administer in powder or tablet 0.36 gram of sodium phosphite and 0.24 gram of sodium acetate. If this is not available, give the following:

Sodium hypophosphite	1 gram
Water	10 mils.
Hydrogen peroxid	5 mils.

Use ten times as much of the hypophosphite as poison taken. Give a copious lavage of stomach with the above antidote diluted twenty times. Give the above undiluted antidote every eight hours for two days.

5. Pour through the stomach-tube after the above lavage a solution of 3 ounces of sodium sulphate and 6 ounces of water containing 5 grains of calcium sulphid. Let these solutions remain in the stomach.

6. Give intravenously after withdrawing 600 c.c. of blood 800 c.c. of Fischer's solution or of bicarbonate-glucose solution.

7. Wash out the stomach morning and night, giving by the mouth after each washing 5 grains of calcium sulphid dissolved in 3 ounces of water. Continue this lavage until the stomach washings are free from mercury when tested by Elliott's method and until the urine is free from mercury.

8. Give high colon irrigations of warm water morning and night, using 8 gallons of the water for each treatment.

9. Give a hot pack twice daily.

10. Give 8 ounces of milk every second hour.

11. Give every second hour 8 ounces of the following solution, by mouth, alternating with the milk:

Potassium bitartrate	dr. j
Sodium citrate	dr. j
Sucrose	dr. j
Lactose	dr. iv
Lemon juice	oz. j
Boiled water	oz. xvj

12. Force the patient to drink large quantities of the alkaline waters, such as Celestin's Vichy or Kalak water.

13. Give a low fat and low protein and high carbohydrate diet for four weeks. Avoid salt in food, as it increases the absorption of the mercury.

14. Give by continuous proctoclysis a solution containing 1 dram potassium acetate, 4 drams glucose, and 3 drams sodium bicarbonate to the pint.

15. Keep the urine alkaline to methyl red.

16. Continue rest of treatment until recovery, usually a period of three weeks.

Chronic Interstitial Nephritis.—Cases of this disease require a special study and the nature of the individual and the stage of the disease must be taken into careful consideration. This is usually a disease of older life. Individuals are used to the habits of a lifetime and very often much harm is done by the unnecessary arbitrary rulings of physicians. The habits of the individual should be disturbed as little as possible unless the physician is certain that they have a direct influence upon the course of the disease. Great care should be taken to avoid acute exacerbations. These, if they do occur, are to be managed like an attack of acute nephritis. The disease is a chronic one in which cure is out of the question. What can be done is to so arrange the life of the individual and the diet as to permit the greatest degree of comfort and the largest amount of activity compatible with the stage of the disease. The patient should be given as much encouragement as possible and in many instances may be allowed to continue his ordinary work, but in some instances this may have to be changed or lightened. If care is taken to avoid all excesses of every kind and to live a life according to the rules of hygiene and follow the instructions, many of these patients are able to work for many years. Vacations in warm, dry climates are very helpful, outdoor exercises of a very moderate kind, usually are an advantage, but should be carefully regulated. Where the blood pressure is high hot baths or carbon dioxid and oxygen baths or warm baths may be employed if the myocardium is in good condition.

The first factor in arranging the diet is to maintain the strength and weight of the individual and for this purpose the protein is first considered, the amount taken being cut to as low a level as possible.

At present there is a tendency to overdo the low protein diet and if the physician has sufficient laboratory facilities sometimes considerable information can be obtained in this regard by a study of the blood non-protein nitrogen. In view of Chittenden's experiments on healthy individuals it would seem advisable to try a diet of 60 grams for a patient weighing 70 kilos. On this amount, if the maximum balance is established, the excretion of nitrogen should be 8 or 9 grams daily. Von Noorden, averaging a series of cases of interstitial nephritis covering five years experience, before Chittenden's experiments, found that for 70 kilos of body weight the nitrogen ingested in males was 13 to 16 grams and in females from 11 to 14 grams, that is about 80 to 100 grams of protein for the males and 65 to 85 for the females. Making allowance for the amount lost in the feces the quantity taken was 90 to 102 grams for males and 80 to 100 grams for females. Based on these figures he gives an average diet of milk, 750 c.c., 2 eggs, bread and vegetables and meat for the men, 215 to 315 grams weighed raw, and women, 155 to 255 grams. The amount of meat in his diet can certainly be made very much less with very great advantage, cutting it to 100 to 150 grams a day according to the condition of the patient. It is rather a good plan to mix the protein, getting part from meat, eggs, and milk and part from vegetables. Having determined the all-important protein factor of the diet the remainder of the caloric needs of the patient are to be made up of carbohydrates and fats. Cereals and breakfast foods with sugar and cream, ripe fruits and fruit juices, well cooked vegetables and simple desserts of compotes or puddings or fruit jellies, together with the necessary amount of bread, toast or the various kinds of crackers, will make up the carbohydrate part of the diet, while butter, cream, olive oil, may be used to supply the fats, in addition to the fats that are taken with the meats. Gelatin jellies in small amounts and green vegetables used as salads are desirable, taking care not to use salad dressings with undesirable irritating substances. The lists of foods in various parts of the book will be found very helpful in arranging the diets, particularly the one showing the amount of salt and protein in ordinary foods.

Having decided upon the foods that are needed for the patient, the next and very important point is to protect the kidney as much as possible from all irritating foods and drinks. All of the foods mentioned as being irritating at the beginning of this section should be strictly avoided. This includes all foods rich in purin nitrogen, lists of which will be found elsewhere. Spices of all kinds, celery, radishes, green peppers, watercress, mushrooms and asparagus, the last named, permitted, perhaps, very sparingly in season, tea, coffee and cocoa are ordinarily forbidden, but may be allowed in small quantities if they do not exert an injurious effect upon the heart and the same is true of tobacco. Careful observations should be made as

to the effect upon the pulse-rate and strength, upon the strength and character of the heart impulse, and to the subjective sensations. Some patients would seem to do better with small amounts of these beverages than without and patients accustomed for a lifetime to the use of tobacco are often more comfortable mentally if permitted the use of a small amount once or twice daily.

In regard to the use of alcohol total abstinence is the rule and the patient should not be allowed any form of alcoholic drink as a beverage with the exception if the individuals should have been alcoholics for many years. In old alcoholics there may be attacks of weak heart or complete anorexia if the alcohol is withdrawn at once, so that under certain circumstances small amounts can be permitted. This can be gradually reduced until none is being used, unless it is found that the appetite and general condition are very much better with than without it. Ordinarily alcohol is looked on with even more disfavor in chronic interstitial nephritis than in acute nephritis.

In addition to the restrictions in the way of foods and drinks there is, of course, great danger of irritating the kidney by using irritating drugs. In this disease it is well to be cautious in the use of all drugs. Owing to its chronicity and the frequent occurrence of intercurrent infections, drugs are apt to be used to greater extent than in any other disease and excreted more slowly than during health. Among the drugs that are injurious are cantharadin, copaiba, turpentine, salicylic acid and its derivatives, phenol, resorcin, boric acid, lead, copper, silver, and mercury and their salts, iodoform and various tartar preparations. This list could be very greatly extended and it should be remembered that any drug that is excreted by the kidneys means extra work for the kidney after given.

The amount of fluid to be allowed a patient should be carefully determined. Ordinarily they are encouraged to take water, milk and diuretic drinks, a practice that is usually followed by bad results owing to extra work thrown upon the heart. A large amount of the fluid taken into the body and absorbed by the intestinal tract is excreted through the kidneys. This means increased blood pressure and increased work for an already over-burdened heart. Von Noorden limits the amount of fluid taken to one and a quarter liters. This includes all kinds of fluids, but does not take into account the water in solid foods which usually amounts to 500 to 700 c.c. daily. The amount of fluid the patient is taking should be determined by measuring everything that he drinks for two or three days and then this amount cut down from 250 to 300 c.c. a day until the patient is taking the desired quantity. One day a week a drink day is allowed on which all the water desired may be taken up to two and a half liters. If it is found that the excretion of the solid contents of the urine takes place as rapidly with this restricted amount of water as before and that in case the excretion is not quite so good the one day

a week flushing keeps the organism clean. In some exceptional cases for two or three months several drinking days may be allowed, one after the other, but if there is failing compensation or any appreciable dilatation of the left heart this flushing out should not be resorted to. The desire for water is greatly lessened by placing the patient on a salt-free or a comparatively sodium chlorid-free diet, as suggested for chronic parenchymatous nephritis. In many cases all that is necessary is to take away the patient's salt cellar. In the more advanced cases the salt-free foods may be chosen. Care should be taken not to overdo the salt-free diet.

Care should also be taken not to allow patients who have a leaning toward obesity too much carbohydrate material. This is frequently done in cases of contracted kidney, usually with bad results. On the other hand, in thin patients, if there is no attendant dyspepsia a diet rich in carbohydrates may very greatly improve the patient's condition.

Home Management of the Diet in Nephritis.—This is always difficult except when a competent nurse can be employed or when one has to do with people of a high order of intelligence. O'Hare, Walsh, and Vickers (Amer. Jour. Med. Sci., clix, 883, June, 1920, and Jour. Amer. Med. Assoc., lxxxi, 1606, November 10, 1923) have suggested a practical method of prescribing approximate diets for nephritics.

Their suggestions are as follows:

NEPHRITIC DIET

Any combination of the foods listed below may be selected.
Foods not listed below must not be taken.
In Groups 1 and 2 there is a restriction in the total amount.
The foods in these groups must be served in full or half portions.
A full portion in Group 1 counts 1.
A full portion in Group 2 counts 2.
In Group 3 the quantity of each is not restricted, although you are urged to use discretion.
Points on recipes to count as indicated.
Your total score for the day should be ....
Your total amount of fluid should be............................ pints.
Do not add salt or spices to the food after it has been cooked.

Group 1

(Each full portion counts 1)

	Full portion.	Vegetables, etc.	Full portion.
Bread (white),	1 av. slice	Baked beans,	1 tbsp.
Bread (graham),	1 av. slice	Lima beans,	1½ tbsp.
Uneeda biscuit,	5 crackers	Potato, creamed,	1 tbsp.
Shredded wheat,	1 biscuit	Potato, mashed,	1½ tbsp.
Graham crackers,	5 crackers	Potato, baked,	1½ med.
Cereals, etc.:		Potato, boiled,	1½ med.
Oatmeal,	2 tbsp.[1]	Canned corn	2½ tbsp.
Boiled rice,	3 tbsp.	Green peas,	2 tbsp.
Cornmeal mush,	4 tbsp.	Beets,	5 tbsp.
Cream of wheat,	6 tbsp.	Spinach,	4 tbsp.
Farina,	6 tbsp.	Bananas,	2 large
Macaroni	4½ tbsp.	Cream, heavy,	⅔ cup

[1]All tablespoonfuls are "rounded."

Group 2

(Each full portion counts 2)

	Full portion.	Fish.	Full portion.
Milk,	1 glass	Cod, boiled,	1″ x 1″ x 1½″
Egg,	1 egg	Haddock, boiled,	1″ x 1″ x 1½″
Eggs (scrambled),	1½ tbsp.	Halibut, boiled	1″ x 1″ x 1½″
Flour, sifted,	⅔ cup	Mackerel, boiled,	1″ x 1″ x 1½″
Meats:		Salmon, boiled,	1″ x 1″ x 1½″
Lamb chop, broiled,	⅔ chop	Smelt,	½″ x 1″ x 3″
Lamb, roast,	3″ x 2½″ x ¼″	Oysters,	7 oysters
Beef, roast,	3″ x 2″ x ¼″	Crabmeat, canned,	2 tbsp.
Beef steak, broiled,	2″ x 1″ x 1″	Salmon, canned,	1½ tbsp.
Chicken, roast,	3″ x 3″ x ⅛″	Shrimp, canned,	6 small

Group 3

(No restriction)

Vegetables.	Fruit.	Miscellaneous.
Asparagus	Apple	Sugar
Cabbage	Apricot	Maple sugar
Carrots	Blueberries	Syrup
Cauliflower	Cherries	Honey
Celery	Cranberries	Candy
Cucumbers	Grapefruit	4 dates a day
Lettuce	Grapes	3 Sunshine arrowroot cookies a day
Mushrooms	Muskmelon	Cornstarch
String beans	Lemons	Arrowrott
Tomato (fresh)	Oranges	Tapioca
Tomato (cooked)	Peaches	Post-toasties
Onions	Pears	Butter
Squash	Pineapple	Olive oil
Turnips	Plums	
	Prunes	
	Raspberries	
	Strawberries	
	Watermelon	

On this sheet are most of the ordinary food-stuffs used in any home. These foods are divided into three groups according to the amount of protein in them. In Group 3 there is so little protein that one can ordinarily ignore it. In Group 1 each full portion (indicated to the right of each food-stuff) contains approximately 4 gm. of protein. In Group 2 each full portion contains approximately 8 gm. of protein. To make it still simpler we avoid mentioning grams and instruct the patient that each full portion in Group 1 counts one point. In Group 2 it counts two points. The number of points for the day is inserted in the blank space left for that purpose at the top of the sheet. A low protein diet would be represented by seven points (28 gm.). A very generous protein diet—for a nephritic patient—would be equivalent to fifteen points (60 gm.). Another blank line for the prescription of the amount of fluid is placed immediately under the prescription of protein. The physician may use his own discretion about allowing tea or coffee or substitutes for these. The patients are not allowed to add salt to the food after it comes to the table. The average patient under this regimen does not get more than 4 or 5 gm. of salt a day. If he is edematous, we can still further decrease the salt by ordering fresh butter, salt-poor bread, vegetables, meats, etc., boiled free from

salt, and, if necessary, the use of distilled water whenever water is used in the diet. The former method reduces the salt intake to approximately 2 gm. a day and the latter to perhaps as low as 0.5 gm. a day.

This scheme is extremely flexible, and foods may be added or subtracted from the list at will. The physician, in response to the patient's request, can fairly easily insert a given food-stuff in its proper space. Indigestible foods and foods not desirable for the given patient may be struck off the list. If the urine has a trace of sugar, the high carbohydrates may be cut out. Again, to reduce the weight of the patient, the high fats and carbohydrates may be removed. Foodstuffs with an acid ash may, if desired, be scratched off.

Nephritic Recipes

Vegetable Soup—0 Point

2 tbsp. onions, chopped; 2 tbsp. carrots, chopped; 2 tbsp. turnips, chopped; 3 tbsp. celery, chopped; 2 tbsp. butter; 1 pint water.

Cook all the vegetables in butter for three minutes. Add the water and boil three-quarters hour or until vegetables are soft.

Creamed Vegetable Soup—1 Point

½ cup strained vegetables from Group 3, ½ cup milk.

Thicken with 1 or 2 tsp. cornstarch moistened in 1 tbsp. cold water.

Cup Cakes (2)—1 Point

3 tbsp. butter; ¼ cup (scant) sugar; ½ egg; ¼ cup milk; ⅔ cup flour; ⅓ tsp. vanilla; 1½ tsp. baking powder (Ryzon or Dr. Price's).

Make into 6 cakes.

Short Cake (2)—1 Point

1⅕ cup sifted flour; 2 tbsp. lard or butter S. P.; ½ cup (scant) milk; 2 tsp. baking powder.

Mix as biscuits and make into 8 biscuits.

Individual Pie—1 Point

⅓ cup flour; 1⅓ tbsp. lard; ⅛ tsp. baking powder (Ryzon or Dr. Price's); ice water to make a stiff dough.

This pie may be made with any fruit from Group 3 for filling. Cornstarch instead of flour should be used for thickening.

Blanc Mange—1 Point

2½ tsp. cornstarch; ¾ tbsp. sugar; ½ cup milk; 2 tbsp. cold water; ¼ tsp. vanilla.

Heat milk in double boiler, add cornstarch moistened in cold water and sugar. Cook until well thickened, add vanilla, and chill. Fruit from Group 3 may be added.

Bavarian Cream—1½ Points

1 tsp. granulated gelatin; 1½ tbsp. cold water; ¼ cup cream whipped; 1 tsp. lemon juice; 2 tsp. sugar; ¼ canned peach chopped fine; ¼ cup boiling water.

Soak gelatin in cold water; dissolve it in boiling water; add lemon juice and sugar and chill until it is the consistency of heavy molasses. Stir in peach pulp or other fruit from Group 3, fold in whipped cream. Chill.

Baked Custard—2 Points

½ cup milk; ½ egg; ¾ tbsp. sugar; flavor with caramel or vanilla.

Beat egg slightly; add milk and other ingredients. Pour into mold and bake in moderate oven with mold standing in pan of water. Note: This custard may be steamed or boiled.

Rice Pudding—2 Points

¼ cup boiled rice; ¼ cup milk; ½ egg; 2 tsp. sugar; 2 tsp. raisins.
To the slightly beaten egg, add milk and other ingredients. Bake in moderate oven until lightly browned.

Tapioca Cream—1 Point

¼ cup milk; 1 tbsp. (scant) tapioca soaked over night in 3 tbsp. cold water; ¼ tsp. vanilla; ⅓ egg; 1 tbsp. sugar.
Drain tapioca, mix with sugar, and add slowly to milk scalding in double boiler. Cook till tapioca is clear. Stir in gradually the beaten one-third egg yolk; fold in lightly the beaten one-third white.

Pineapple Mousse—½ Point

⅓ cup cream, heavy; 1½ tbsp. shredded pineapple; ½ tsp. lemon juice; 1 tbsp. sugar.
Whip cream, then fold in other ingredients, previously mixed. Pour into mold, cover, and pack in 3 parts ice to 1 part salt, for one and one-half hours or until frozen through.

Ice-cream—1 Point

⅔ cup cream flavored as desired with fruit from Group 3 and sugar.

Water Ice—0 Point

Any combination of fruit from Group 3 sweetened and frozen.

Nephritic Dressing—0 Point

(As used on salad, does not count any points.)
1 egg yolk; 1½ cups salad oil; 4 or 5 tsp. lemon juice; 1 tsp. sugar.
Beat the egg yolk, add 1 or 2 drops of lemon juice. Then drop by drop beat in the salad oil. Thin down with the lemon juice, adding only part of it at a time. Add sugar last.

For those who prefer to give the patient a list showing the number of calories and the grams of protein, the following by Clarke (Clifton Medical Bulletin, December, 1923, 162) is a valuable suggestion. Additional articles may be added by consulting either Locke's tables at the end of this volume or the other tables to be found throughout the book.

The abbreviations used in the sheet are as follows:

h.tb.	heaping tablespoon
ts.	teaspoon
av.	average
med.	medium
″	inches
cup	a measuring cup

Clifton Springs Sanitarium Restricted Protein Diet List

For the day you should choose
———grams protein from Table I. Breads and Cereals.
———grams protein from Table II. Fruits.
———grams protein from Table III. Vegetables.
———grams protein from Table IV. Meat and Fish.
———grams protein from Table V. Dairy Products.
———grams from Table VI.
The total amount for the day, ———grams protein.
Approximately ———calories
Approximately grams or ——— teaspoonful of salt
Your total amount of fluid should be ———pints.

TABLE I

Breads and Cereals

	Portion.	Wt. in grams.	Grams of protein.	Calories.
Bread, graham	1 slice, 3¾″ x 2¾″ x ½	37	3	99
Bread, rye	3½″ x 3″ x ½″	39	4	102
Bread, white	3½″ x 3″ x ½″	30	3	80
Biscuits	1 biscuit	35	3	100
Cornbread	3″ x 2″ x ¾″	39	3	104
Flour	⅞ cup	100	11	352
French rolls	1 roll	39	3	112
Graham crackers	5 crackers—3″ square	40	4	170
Uneeda biscuits	7 biscuits—3″ square	42	4	175
Cornflakes	1⅓ cup	28	2	100
Cornmeal mush	3 h.tb.	115	2	96
Cream of wheat	½ cup	112	2	59
Farina	4 h.tb.	200	3	112
Food of wheat	½ cup	112	2	59
Grapenuts	1 tb.	9	1	33
Macaroni, boiled	3 h.tb	150	4	136
Oatmeal	3 h.tb	150	4	94
Pettijohns	½ cup	117	2	77
Puffed corn	1 cup	30	1	100
Puffed rice	⅝ cup	15	1	50
Puffed wheat	1⅔ cup	30	4	100
Ralston's	½ cup	108	2	54
Rice, boiled	1½ h.tb.	150	4	168
Shredded wheat	1 biscuit	29	3	109
Spaghetti with tomato	3 h.tb.	145	5	150
Sunnycorn	½ cup	121	1	62

TABLE II

Fruits

	Portion.	Wt. in grams.	Grams of protein.	Calories.
Apples	2 av. size	300	1	144
Apricots, cooked	¼ cup	64	1	100
Banana	1 av. size	194	2	127
Blackberries	3 h.tb.	100	1	59
Cantaloupe	1 melon, 4½″ diam.	500	1	100
Cherries	25-30 cherries	100	1	76
Currants	5 h.tb.	125	2	74
Dates	5 large	41	1	133
Figs	4 figs	30	1	100
Grapefruit	½	100	1	50
Grapes	small bunch	100	1	75
Grape juice	½ cup	100	..	100
Lemon juice	1 tb.	12	..	5
Olives, ripe	10-12 olives	60	1	125
Orange	1 orange, 3″ diam.	200	1	75
Peaches	1½ av. size	192	1	66
Pear	1	156	1	90
Pineapple	5 slices	250	1	110
Plums	3 av. size	105	1	87
Prunes	5 large	100	2	262
Raisins	20	50	1	160
Raspberries	4 h.tb.	109	1	61
Rhubarb	3 stalks	238	1	100
Strawberries	4 h.tb.	100	1	40
Watermelons	2 large slices	500	1	75

TABLE III

Vegetables

	Portion.	Wt. in grams.	Grams of protein.	Calories.
Artichoke	1 artichoke, 4″ x 3½″	360	6	97
Asparagus	8 lg. stalks 3″ long	125	2	23
Beans, baked	1 h.tb.	50	4	99
Beans, lima	1½ tb.	60	5	98
Beans, string	4 h.tb.	120	1	26
Beets	2 h.tb.	70	2	29
Beet greens	1 h.tb.	50	1	27
Cabbage	5 h.tb.	166	1	8
Carrots	6 h.tb.	200	1	36
Cauliflower	2 h.tb.	120	1	8
Celery	6 small stalks	110	1	16
Corn, canned	3 h.tb.	150	4	150
Cucumbers	20 thin slices	125	1	22
Eggplant	slice 4″ x 3½″ x ½″	100	1	28
Lettuce	head 3″ diam.	100	1	19
Mushrooms	⅖ cup	60	2	100
Okra	4 small pods 2″ long	50	1	38
Onions	medium size	100	1	42
Parsnips	3 pieces, ⅓″ x 3½″ x 1½″	87	1	50
Peas	2 h.tb.	60	4	72
Potatoes, baked	med. size	130	4	149
Potatoes, boiled	med. size	150	4	145
Potatoes, creamed	4 h.tb.	115	4	141
Potatoes, mashed	3 h.tb.	150	4	168
Potatoes, sweet	av. size	100	3	204
Pumpkin	½ cup	100	1	25
Radishes	5 av. size	28	1	11
Sauer kraut	⅜ cup	66	1	18
Spinach	2 h.tb.	100	2	57
Squash, summer	¾ cup	147	1	33
Squash, Hubbard	½ cup	120	1	55
Tomatoes	3 h.tb. cooked or 1 av.	100	1	24
Turnips	4 h.tb.	280	1	12

TABLE IV

Meats and Fish

	Portion.	Wt. in grams.	Grams of protein.	Calories.
Beef, roast	1 av. slice	50	11	178
Beef, steak	1 piece, 3″ x 1″ x 1″	50	12	143
Chicken, fricassed	1 slice	50	9	94
Duck	1 slice	50	9	122
Lamb, chop	one chop with bone	50	11	183
Lamb, roast	1 av. slice	50	10	100
Turkey	1 slice	50	14	142
Clams	3 clams or ⅙ cup	114	7	50
Cod	piece 2″ x 1½″ x 1″	50	11	49
Haddock	2″ x 1½″ x 1″	50	11	54
Halibut	2″ x 1½″ x 1″	50	10	60
Lobster	¼ cup	40	7	35
Mackeral	2″ x 1½″ x 1″	50	8	74
Oysters	6 oysters	85	5	44
Salmon	2″ x 2″ x 1″	50	10	99
Shrimp	5 shrimps	35	8	37

TABLE V

DAIRY PRODUCTS

	Portion.	Wt. in grams.	Grams of protein.	Calories.
Butter	1 square equal to 1 tb.	15	..	115
Buttermilk	1 cup	218	7	80
Cheese, American	1 cubic inch	20	6	91
Cheese, Dutch	1 h.tb.	35	7	37
Cream, 20%	3 tb.	50	1	27
Cream, 40%	6 tb.	100	1	375
Cream, 20% whipped	6 tb.	50	1	27
Egg	1 egg	50	6	75
Ice cream	5 tb.	96	2	200
Milk, skimmed	1 cup	222	8	84
Milk, whole	1 glass	220	7	157

TABLE VI

MISCELLANEOUS FOODS

	Portion.	Wt. in grams.	Grams of protein.	Calories.
Cornstarch	2 h.tb.	30	..	108
Honey	1 tb.	30	..	101
Maple sugar	1 cake	100	..	339
Maple syrup	1 tb.	30	..	88
Oil	1 tb.	11	..	100
Salt	1 level teaspoon	4	..	..
Sugar	1 h.tb.	10	..	41
Tapioca	2 h.tb.	30	..	100

FLOATING KIDNEY

In this condition two things are to be especially recommended—viz., rest and food. The diet should be one that will cause the patient to take on as much flesh as possible. Many cases of movable kidney come on in nervous individuals who have lost flesh, and when the fat normally surrounding the kidney is replaced, the organ no longer floats about. The rest cure is especially recommended in those cases that occur in nervous people who have lost flesh rapidly. Time and patience are required, and the treatment often fails because it is not persisted in for a sufficiently long time. In cases of long standing a diet similar to that recommended in gastroptosis and enteroptosis should be prescribed.

AMYLOID KIDNEY

This condition requires a supporting diet of good food, and measures directed toward removing the cause of the amyloid disease.

PYELITIS.—PYELONEPHRITIS

The diet in these conditions should be very bland and non-irritating. The substances and foods previously mentioned as irritating should all be avoided. Milk, buttermilk, almond milk, and the like, should form the bulk of the diet. Milk-toast, gruels, and cereals may also be given. If the heart is strong, an abundance of fluid may be allowed in order to flush out the kidneys; alkaline mineral waters and flaxseed tea are among the best for this purpose. Care should be

taken that the patient receives sufficient protein daily. Increase of diet may be made along the same lines as are indicated in acute nephritis.

RENAL AND VESICAL CALCULI

The diet as a cause of stone, especially of the uric acid variety, has been the subject of much controversy. In children it has been stated that the formation of stone usually follows a poor and insufficient milk supply. Ordinarily it may be said that too rich food, too large meals, and an inactive life are the most potent causative factors. Certain individuals are prone to calculus-formation.

The following suggestions regarding the diet will be found useful: Forbid strong drinks, and all alcohol if possible; much meat, and especially the nuclein-containing meats, as thymus, spleen, liver, brain; caviare, etc., smoked, pickled and spiced meats, and rich foods in general. The fats and sugars, as well as the cereals, should be restricted. The diet should be made up of the plainer, well-prepared foods, and, as far as possible, a vegetable diet should be prescribed. Water, especially the alkaline mineral waters, may be allowed in abundance. When alkaline mineral waters are given for acid stones, they should be used only so long as the urine remains acid. If it becomes alkaline, the waters should be discontinued, lest phosphates be deposited on existing stones.

LITHEMIA.—THE SO-CALLED URIC-ACID DIATHESIS

The factors in the causation of this disease are heredity, a too abundant and a too rich diet, and an inactive life. It may be regarded as an irregular form of gout. At present the views concerning its pathology are too diverse and numerous to deserve comment. The condition is usually manifested by migraine, neuralgia, sick headache, skin eruptions, and the like.

The diet is the principal factor in the treatment, and scarcely of less importance are fresh air and exercise. It is more common among the well-to-do in winter, for out-of-door life in summer usually means more or less nearly perfect metabolism.

The diet should be similar to that outlined elsewhere for the gouty. A reduction in the quantity of food taken, especially of the protein supply, and an avoidance of alcohol and rich, complex foods are the principal indications. (See Gout.)

GONORRHEA

The diet in this disease is of considerable importance. Improper food and drink not only serve to prolong the disease, but overindulgences in forbidden articles may cause a return of the discharge even after the disease has apparently been cured.

The directions for diet are very simple. All irritating foods and

drinks should be avoided, as should all indigestible articles. The diet should consist of plain and wholesome food. Where it is possible, skim-milk should form the basis of the diet. Too much meat should not be taken, and twice-cooked meats and fried and very greasy foods avoided as far as possible. Carbohydrates, as breadstuffs, cereals, and the non-acid vegetables, may be allowed. Care should be taken to avoid all complicated and highly seasoned foods, all pepper, spices, and salad dressings. In a word, everything previously mentioned as irritating to the genito-urinary tract should be avoided. Acid fruits, asparagus, and tomatoes are also to be forbidden. Tea and coffee should be prohibited or given very weak and well diluted with milk or cream. All alcoholic drinks should be forbidden. When the patient must drink, in order to avoid suspicion, claret has been recommended as least irritating, but even this is best avoided.

An abundance of plain or effervescing water should be taken, but not in sufficient quantities to disturb digestion. It is best to drink the water between meals and on an empty stomach. Flaxseed tea and similar demulcent drinks may be helpful.

Tobacco may be allowed habitués, but not in excess. Moderate smoking in those accustomed to the habit is regarded as beneficial rather than as harmful.

DIET IN DISEASES OF THE NERVOUS SYSTEM

The necessity for the correct management of the diet in nervous diseases is becoming appreciated more and more every year. As a general rule it may be stated that all functional diseases attended with emaciation are greatly benefited, if not entirely relieved, merely by increasing the patient's weight by such methods as are suggested under the heading of Rest Cure. Patients with chronic organic lesions will, as a rule, be made more comfortable if the following two points are borne in mind. First, to overcome, so far as possible, emaciation and anemia where the nutrition has a tendency to be below normal; and, secondly, and of no slighter importance, to prevent undue obesity in those so inclined, particularly where there is disturbance of locomotion. A patient may be condemned to remain in bed or in a chair on account of the excessive weight which his inactivity has fostered. For further particulars on this subject the student is referred to the section on Obesity.

Most patients regard diet as a very unimportant part of the treatment; this is true especially of those cases that most need careful feeding. The necessity for careful dietary should be impressed upon these patients, and a faith in its efficacy engendered where the disease is of a functional nature.

The diet suitable in nervous diseases has been the subject of many diverse opinions, particularly in the minds of the laity. Fish has been vaunted as a "brain food," and various fats or cereals have been

suggested for nervous conditions. At the present time, it may be stated, there is no specific "nerve food." The nutrition of the nervous system will be good when the patient's general nutrition is good, and *vice versâ*. Both in functional disorders of the nervous system and in the psychoses dependent upon exhaustion the improvement of the general condition should be the first care.

The basis of the diet, which will be outlined later, is usually milk. Care should be taken to see that the patient gets sufficient fluid, and where no tendency to obesity exists, water should be taken with each meal and usually at bedtime and on rising. It may also be taken between meals if desired. When there is disturbance of digestion, it is a good plan to prepare the stomach for the meal by sipping a glass of hot water on rising and an hour or less before each meal. The mineral waters may be used when desired; the alkaline ones are apt to be of most value. Carbonated waters should be used with care, lest the flatulence they may cause give rise to symptoms the importance of which may be greatly exaggerated by the patient.

A question of great importance is whether or not alcohol should be used. As a general rule it should not be allowed. In cases with chronic lesions, where the patient has been accustomed to the use of alcohol all his life, it may be allowed, if not otherwise contraindicated, as by a tendency to cerebral hemorrhage, arteriosclerosis, chronic interstitial nephritis, and the like. The use of alcohol in the functional disorders is usually contraindicated.

NEURALGIA

Neuralgia may be due to many causes, among them being the various diseases that affect metabolism. The cause of the neuralgia must be determined before a suitable diet can be ordered. The following are among the most frequent causes: anemia, gout, lithemia, rheumatism, diabetes, and alcoholism. The diet to be prescribed is the diet suited to the condition.

Alcohol is a frequent cause of severe neuralgias often simulating migraine. The quantity used may be comparatively trifling, and the patients frequently can not be classed as alcoholics. When no other cause for the disease is found all alcohol should be forbidden. In the cases dependent on anemia and on exhausted conditions alcohol is, however, useful, and should be used in these cases to improve the nutrition, and not for the temporary feeling of well-being or for the relief of pain, which it may in reality engender.

Tea and coffee should be forbidden in chronic neuralgia or where there are frequent attacks. This does not, however, apply to attacks of migraine that are not affected by coffee, or may even be relieved by a cup of hot strong coffee taken as the attack is about to come on.

According to Gowers, vegetarianism may be a cause of neuralgia. In these cases the addition of meat to the diet will give relief. The converse may be true, especially where there is a gouty tendency, the

ingestion of too much meat frequently being at the root of the trouble. Care and experience alone will help in deciding whether the patient is getting too much food, and whether his diet should be cut down and his elimination increased, or whether the case is dependent on an insufficient or improper diet.

As a general rule, plain wholesome food should be ordered at regular intervals. The patient should not be allowed to eat between meals. All rich, complex, and highly seasoned foods should be forbidden, as should all fried foods, pastry, and anything known to disagree with the patient. Care should, however, be taken that the diet be not too restricted, for the patient's ability to take different articles is often purely imaginary. True idiosyncrasies for different articles of food are not very common. The excessive use of tobacco may be the cause of neuralgia.

GASTRALGIA

A general rule may be made in these cases of avoiding excesses in alcohol, tea, coffee, sweets, and tobacco. In some cases the taking of food increases the severity of the attack. The existence of stomach disorders should be carefully determined, and if there is no apparent basis for the trouble, a rest cure may give relief.

There are other cases where the pain comes on when the stomach is empty. (See Diseases of the Stomach.) In these relief is often afforded by giving a cup of hot milk or bouillon with a biscuit (cracker) in the middle of the morning and afternoon, and at night on going to bed. If the pain begins in the night from the same cause, a glass of milk should be kept at the bedside, and when the patient is awakened by the pain, he may take a few sips of the milk.

VISCERAL NEURALGIA

When this is not relieved by ordinary means, the patient should be put to bed and kept on a milk diet. Repeated examinations should be made to determine the exact cause of the trouble. Many of these cases, where no cause can be assigned, are relieved by rest and a milk diet.

MIGRAINE

Migraine, or sick headache, as it is popularly termed, should not be confused with ordinary neuralgia. The diagnosis may at times be somewhat difficult. Much can be done to lessen the frequency of the attacks, but any attempt entirely to overcome them has thus far proved fruitless. Open-air life of a vigorous kind probably does more good than anything else, but most of the sufferers from migraine find this impractical to carry out. The life of the patient should be regulated carefully. Sufficient sleep should be obtained and late hours avoided. The food should be plain and wholesome, and taken

at regular intervals, and eating between meals should be discountenanced. Outdoor exercise should be insisted upon wherever possible. Excesses of all kinds must studiously be avoided.

It may be mentioned that sufferers from migraine are apt to attribute the cause of the attack to some article of food. This is not likely to be the case, and the patient should not be allowed to cut off first one and then another necessary article from his diet. Starch indigestion is present in some, and should receive careful attention. These patients occasionally get along best on a diet that is largely vegetarian, but this is not so in all cases. Coffee need not be prohibited, for, as a rule, it is not the cause of the trouble, and in some instances, when taken at the outset of an attack, it may even afford relief.

INSOMNIA AND DISTURBED SLEEP

When not dependent upon other conditions, these are apt to be due either to eating at night or to a depressed state of the nutrition. For the first there is nothing to do but to discontinue the habit of eating at night. There are but few persons who reach middle age and who can eat late at night with impunity, and sooner or later the individual learns that he must give up the habit. There are some, however, with whom the practice seems to agree.

When the trouble is caused by malnutrition or anemia, the general condition of the patient must be treated. Good food, regular hours, milk, or some light food between meals, and on going to bed a cup of hot milk, cocoa, or, if preferred, beef-tea, malted milk, or similar preparation may be ordered.

In many cases where the nutrition is fairly good one of the hot drinks just mentioned taken at bedtime may be all that is necessary. This is especially true of the insomnia and disturbed sleep that follow the doing of mental work at night. The effect is to dilate the abdominal vessels and to restore the equilibrium of the circulation. A brisk walk in the open air or five minutes' exercise will often accomplish similar results.

In the aged and the weak a ''night-cap,'' in the form of a small glass of brandy or whisky, or a hot toddy, is acceptable and secures a good night's rest. This should, however, be discountenanced in the young and vigorous.

VERTIGO

There are so many forms of vertigo, and it arises from so many widely different causes, that it must not be forgotten that a very common cause is in a disordered digestion. Indigestion from whatever cause may give rise to it, and the eating of certain irritating foods, such as shell-fish, crabs, lobsters, and the like, may occasionally bring on an attack, particularly in those unaccustomed to their use. Insufficient food may also be a cause. All causes of vertigo require careful study before a definite opinion as to their cause is given.

EPILEPSY

Epilepsy bears an important relation to diet. There is no specific "anti-epilepsy" diet, and there is no form of food that can be assigned as a cause of epilepsy; it is, however, a fact, that where the diet is carefully regulated the number of attacks are usually lessened. This is particularly true of children. The principle involved is to give only as much food as the patient can easily digest and assimilate, and to allow sufficient time to elapse between feedings for him to utilize and excrete the end-products of what he does assimilate. When this is not done, attacks may be provoked by irritating substances in the bowel, by the absorption of toxic substances from the intestinal tract, or by the accumulation of the products of metabolism in the body. In the epileptic colonies no especial diet is used, but the amount and the variety of food are so regulated as to secure the best results. (See Craig Colony Dietary.)

In children a diet composed largely of milk with the addition of cereals and fruit, is most useful. In older persons this diet is not feasible except occasionally as a temporary measure. For these latter meat should be allowed only once a day, unless, on account of excessive manual labor or because of a weakened condition of nutrition, the patient especially demands it. Milk, cereals, bread, vegetables, and fruit should make up the rest of the dietary. Each patient should be instructed to take only digestible food, to take his meals regularly, and not to eat too much. They should also be taught to eat slowly and masticate the food well. The avoidance of constipation is of primary importance, and this can usually be secured by the proper use of fruits, and the coarser forms of cereals.

A diet free from sodium chlorid with sodium bromid substituted is of considerable value in the treatment of epilepsy. The effect is more noticeable in the petit mal than in grand mal, but in both there is a decrease in the number of seizures. The effect of this treatment varies in different individuals. German and French observers report remarkable results, but these have not been obtained in the United States, although there seems to be little question of the value of the treatment. In some patients the withdrawal of sodium chlorid produces untoward effects, and these are more liable to occur when the bromid is not substituted. The salt-free diet is to be regarded as an adjunct to the bromid treatment. When the régime is badly borne there are dizziness, headache, weakness of the legs, loss of memory, edema, diarrhea, and often marked mental symptoms with a tendency to melancholia. There may be a marked loss of appetite, which may lead to a marked aversion for food. Some of Voisin's patients had to be forcibly fed. Sometimes the withdrawal of salt causes irritability in the young, and may rouse the indolent to activity.

Starvation for a period of from seven to twelve days, during which time orange juice is given in as large amounts as desired, providing there is no intestinal disturbance, has been suggested in epilepsy. In

many patients a transient improvement is noted, and in about 3 per cent. a rather prolonged period of complete or nearly complete cessation of attacks may be brought about. While this is not curative, a trial may be given, and when there is a prolonged period of freedom from attacks it may be repeated from time to time. The danger of ill effects from the starvation should be borne in mind. Weeks and his co-workers (Journal of Metabolic Research, 3, 317, February, 1923) studied small groups of patients fed several weeks on diets high in protein (up to 360 grams with 32 grams of fat), high calories (over 8000), high carbohydrate (from 500 to 800 grams), and high fats (from 260 to 440 grams). They did not notice any relation of seizures to these diets. The whole subject should be restudied and put on a scientific basis.

Quiet, open-air life, pleasant occupation of a non-strenuous kind, an absence of worry, and agreeable forms of recreation are just as important as the diet in these cases.

CHOREA

In chorea the diet is often of the greatest importance; this is especially true when it occurs in anemic or debilitated children. Rest and an easily assimilable diet are the indications. The authors are of the opinion that absolute rest in bed, if possible isolated from the remainder of the family and under the care of a trained nurse, who should be a stranger, combined with a milk-diet or a diet composed largely of milk, will give better and more lasting results than any other form of treatment. If the patient is anemic, beef-juice made from fresh beef may be used to advantage, as well as raw scraped beef and similar foods. (See Anemia.)

APOPLEXY

The Comatose Stage.—During the early stage of the comatose condition—*i. e.,* for the first day or two—there is, as a rule, no necessity for giving the patient any food. As the disease is most likely to occur in obese, overfed individuals, the abstinence from food is often beneficial. The intestinal tract should be flushed out as soon after the patient is seen as is practicable. Those about the patient should be instructed carefully as to the dangers of attempting to feed the patient if he is unable to swallow, for he may, on the one hand, choke, and, on the other, he may draw food or drink into his lungs during inspiration, and so set up a pneumonia.

If the patient is in need of nourishment or of fluid, it may be given by the rectum. Normal salt solution may be given by the rectum to supply the body with fluid, but it should not be given in too large quantities. (See Rectal Feeding.)

The Later Stages.—As soon as the patient recovers sufficiently to be able to swallow without danger of inspiring the food, he may be fed by the mouth. The food should be liquid or semi-solid, and of

a bland, unstimulating character. The quantity should not be too large. Milk, milk and eggs beaten together in the form of a milk-punch, without, however, the addition of a stimulant, broths, soft eggs, and milk thickened with cereals, or the purées of vegetables may be used. As the patient improves other food may be added, but the diet should be light, easily digestible, and as non-stimulating as possible. The patient should be warned against overeating and also against drinking. Alcohol is allowable only in the case of habitués who are threatened with collapse unless it is used, or in the same class where food is not assimilated without it. It should always be given in moderate amounts, and the dosage arranged by the physician, and never left to the nurse, the patient, or the family.

On account of the lack of exercise the diet should contain but little meat, but cereals, vegetables, and fruit should be given in small quantities at a time, and as evenly distributed throughout the day as possible, to avoid overfilling of the vessels.

The greatest danger, from a dietary standpoint, is in those patients who recover sufficiently to return to their ordinary modes of living. They should be very carefully instructed neither to drink to excess nor to overeat. A full meal and several drinks may be the cause of a second or of a fatal attack. (See High Blood-pressure.)

DIET IN VARIOUS TOXIC CONDITIONS

CHRONIC MORPHIN POISONING

In the treatment of the morphin habit the diet is of great importance. A good plan is to institute the rest treatment and to give the patient as much food as possible. This method has the additional advantage that the patient is kept under better control if the nurse can be trusted; and none but one of the highest character, who cannot be bribed, should be employed.

In obese women who have formed the morphin habit—and many women who use the drug are apt to take on flesh—rest in bed, with a milk diet, massage, and electricity, may be of great service.

ALCOHOLISM

The mild forms of alcoholism are usually easily managed. So long as the stomach is irritable it should be given absolute rest. If possible, alcohol should be withheld entirely. As soon as the stomach will retain fluid, a saline mineral water or a saline purge should be given. Milk or bouillon is next to be prescribed, and, as the desire for food returns, a light diet of soft-boiled eggs, milk-toast, and the like should be allowed. After recovery all rich and highly seasoned food should be avoided, particularly the spices and peppers, which are commonly used to excess.

In the severe forms the diet should be that recommended for chronic gastritis. Some confirmed alcoholics can retain nothing in

the stomach until they have had their morning drink. When nutrition is threatend, this may be allowed, but it is apt to lead to excesses later in the day.

In the very severe forms, as in delirium tremens or in cases approaching it, the patient should take as much fluid as possible to flush out the system and the intestinal tract should be thoroughly purged. The food should be given in a predigested or in a partially predigested form, and at frequent intervals. In this way the craving for drink is somewhat alleviated. Bouillon or beef-tea to which considerable amounts of black pepper or even Cayenne pepper have been added is useful in this condition, although their use would be contraindicated for any but an alcohol-saturated person. Rest and suralimentation as soon as food can be borne constitute the best method of managing these cases. Strychnin may be used as a stimulant, and belladonna in large doses is of service.

Illness or Injury in Alcoholics.—When a man who has been accustomed to taking several glasses of liquor every day for years is suddenly stricken ill or injured, delirium will often develop if the stiumulant is rapidly withdrawn. In all such cases the accustomed amount of alcohol should be given, care being taken, however, to prevent overindulgence.

In alcoholics affected with pneumonia alcohol is necessary to sustain life. When delirium occurs in the course of pneumonia, alcohol should be ordered, although in ordinary, uncomplicated cases of delirium tremens due to extreme overindulgence it should be withheld.

CHRONIC LEAD POISONING

In this state especial effort should be made to ascertain the cause, and where the condition is due to the handling of lead, frequent washing of the hands and cleansing of the finger-nails, particularly before eating, should be advised.

Oliver states that abstinence from alcohol serves as a preventive, and advocates that a substantial meal be taken before beginning work. Constipation is to be overcome by dietetic or medicinal means. Water should be drunk freely, and lemonade containing diluted sulphuric acid or aromatic sulphuric acid is advised as a prophylactic drink. Ten or fifteen drops of the acid may be added to a glass of water. Milk is also drunk as a preventive by the workers in factories, but is probably of use chiefly as a diuretic and for maintaining the nutrition.

THE WEIR-MITCHELL REST CURE

In his little book, Fat and Blood, destined to be one of the classics of medicine, Weir Mitchell has given us the technic of his "rest cure," which has been used so successfully in the treatment of certain cases of nervous exhaustion. Others have made suggestions, and

Playfair, Leyden, Keating, and others have given directions, and diet-lists, but they differ but little from those of Mitchell, and are not nearly so satisfactory. A careful reading of this book is recommended, for nothing beyond the essentials of the treatment can be given here.

Mitchell defines the cure as a "certain method of reviving the vitality of feeble people by a combination of entire rest and excessive feeding, made possible by passive exercise obtained through steady use of massage and electricity."

The treatment is applicable to many forms of nervous exhaustion, but particularly to nervous women who have lost weight,—as Mitchell says, "those who are thin and lack blood."

Before beginning this treatment it is important to ascertain whether the patient "is losing or has lost flesh, is by habit thin or fat." In those who have become emaciated as a result of disease a thinning of the blood occurs at the same time, and as the patient recovers the former body-weight, the blood, as a rule, becomes richer. There are certain anemic fat persons who require individual consideration. (See Obesity.) In fat, nervous patients the treatment is of little benefit, as it tends to increase the accumulation of flesh; if other circumstances allow, these cases are better treated by a reduction cure, as detailed in another section. Those who derive most benefit from this treatment are patients that have lost flesh. The cure is indicated in nervous, exhausted conditions, and in certain other diseases in which the patient has lost flesh. In the very earliest stages of pulmonary tuberculosis this treatment, combined with an abundance of fresh air, is of benefit. For dyspeptics, cases of chronic malaria poisoning, and the like, it may also be recommended. In short, in any condition in which there are wasting and anemia, whether or not emotional disturbance is present, the rest cure will be found useful. Women are better subjects for this treatment than are men, as the latter are less able to endure the isolation. In women who are thin and anemic and who complain of being tired constantly, the cure is of the greatest service. These women become exhausted out of all proportion to the amount of exercise they take, and the "tire" shows, as Mitchell puts it. In some cases nausea or diarrhea may even follow exertion.

While the cure usually succeeds in properly selected cases, Mitchell states that in certain cases failure results from what he aptly terms "an unconquerable taste for invalidism," from "sheer laziness," or in those cases "to whom the change of moral atmosphere is not bracing."

The method is more likely to succeed and is easier to conduct in severe cases than in mild cases. Playfair speaks of "the half-ill who constitute the difficult cases." Organic disease is a contraindication, but there are certain conditions that are benefited by it. Heart

disease with ruptured compensation and the irritable heart of exophthalmic goiter are both suitable conditions for this treatment. Many uterine and ovarian disorders are cured by it, rendering operation unnecessary, and those cases that have been operated upon without bringing relief may often be restored to health by this method of treatment. Floating kidney, as mentioned elsewhere, is a suitable condition, if the case is a recent one, for the rest treatment. Certain forms of mental disturbance are greatly benefited by it, and the method of forced feeding of the insane is but an example of this method of treatment. Melancholia with periods of agitation is often benefited by several weeks' quiet and proper feeding when the agitation comes on.

The technic of the treatment is explained in a most interesting way by Mitchell, and the following details, largely condensed, are taken from his book. The more nearly perfect the technic and the more closely it is adhered to, the more likely is cure to follow. The cases are of various grades of severity, and the treatment should be modified to suit the individual.

Isolation is necessary, and the patient should be removed to a hospital or a sanitarium, away from familiar scenes. Home treatment does not succeed well. If circumstances compel the patient to remain at home, her room should be changed. In severe cases with emotional manifestations visiting is forbidden, but it may be allowed to a "certain extent where the patient is anemic owing to a distinct cause, as overwork, blood-losses, dyspepsia, low fevers, or nursing."

The nurse should be a stranger to the patient, and if for any reason the patient does not get along with the nurse, another nurse should be secured. She should be a strong, healthy, firm woman, with tact and sufficiently attractive qualities. The family should not be allowed to nurse the patient, for, as O. W. Holmes says, "the hysterical girl is a vampire who sucks the blood of the healthy people about her."

Communication with friends and family should, as a rule, be cut off entirely, and not even the reading of letters should be allowed. After several weeks, if the patient is improving, she may be allowed to read the newspaper each day.

Rest is a most important feature, and, as a rule, the patient should be put to bed for six weeks or two months.

In other cases, especially where the patient is not able to undergo the regular treatment, as in dispensary cases, a modified rest cure may be tried. The following is Mitchell's schedule for such cases; this may be modified according to circumstances:

"7.30 A. M.: Cocoa, coffee, hot milk, beef extract, or hot water. Bath (temperature stated). Rough rub with towel or flesh-brush. Bathing and rubbing may be done by attendant. Lie down a few minutes after finishing.

"8.30 A. M.: Breakfast in bed. (Details as to diet. Tonic, aperient, malt extract as ordered.) May read letters, papers, etc., if eyes are good.

"10–11 A. M.: Massage if required is usually ordered one hour after breakfast, or Swedish movements are given at that time. An hour's rest follows massage. Less rest is needed after the movements. (Milk or broth after massage.)

"12 M.: Rise and dress slowly. If gymnastics or massage are not ordered, may rise earlier. May see visitors, attend to household affairs, or walk out.

"1.30 A. M.: Luncheon. (Malt, tonic, etc., ordered.) In invalids this should be the chief meal of the day. Rest, lying down, not in bed, for an hour after.

"3 P. M.: Drive (use street cars or walk) one to two and one-half hours. (Milk or soup on return.)

"7 P. M.: Supper. (Malt, tonic, etc., ordered, detail of diet.)

"10 P. M.: Hot milk or other food at bedtime."

This may be altered by omitting the out-door exercise in invalids or for business men who can rest only part of the time by conducting their business in the morning, utilizing the afternoon for massage and rest. If massage is not ordered, no expense is attached to this routine.

In extreme cases the patient is made to rest absolutely. No exertion of any kind is to be allowed. The bed-pan is to be used with the patient in the recumbent position. She should be removed to a couch for an hour, both morning and evening, while the bed is being freshened. The patient should be fed, and later, when allowed to feed herself, the meat should be cut up for her. A sponge-bath should be given daily, but if it causes depression, it may be given less frequently. After two weeks, if it is thought desirable, the patient may be read to for one to three hours. The monotony of the treatment is not so trying as would be imagined, for the routine of the day occupies most of the time. An important part of the treatment is the moral suasion, and when no good can be attained in this direction, the physician should judiciously seek to lead the thoughts of his patient to the selfishness of the life previously led. The nurse and masseuse should not be allowed to talk about or to listen to the patient's ills, and she should be taught that she must speak of them only to the physician.

Massage and electricity are resorted to in order to maintain nutrition and circulation while at rest. Mitchell gives minute instructions regarding both. General massage of the whole body is to be given, care being taken not to excite pain by manipulating tender areas. The tapping movements, slapping, and the like are not to be used in nervous patients. Care should be exercised to avoid pro-

ducing sexual excitement; this may be aroused in both sane and insane patients from friction near the genitals or over the back or buttocks. If it does occur, the operator should avoid the sensitive areas. In the average case massage should be given for an hour daily for about six weeks, and then on each alternate day. The time chosen for this should be about midway between meals. Care should be taken to keep the parts warmed by the massage well covered.

The same precautions should be taken in using electricity as when giving massage. The induced current should be used, and it is well to employ a battery in which the breaks are very slow—from two to five seconds. The more rapid interruptions are useful, however, but in the hands of an unskilful operator may excite pain and apprehension in the patient. The poles may be placed four or five inches apart on the muscle, and the whole body should be gone over.

The diet is one of suralimentation. In many cases milk should form the basis of the diet at first. Karell's method of administration is to be used. (See Milk Cure.)

If those patients who are obese, anemic, and nervous (or even when they are not), in whom the other methods of reduction are of no value, a reduction secured by means of rest and a milk diet often succeeds. The milk may be skimmed if necessary. The patient is put to bed and placed on a milk and general diet and then on an exclusive milk diet. Massage and electricity are employed, and the patient's weight is noted. If it does not decrease, the amount of milk is decreased to three pints or even to a quart a day until the weight has fallen to the desired number of pounds. The diet is then gradually increased and the patient by degrees allowed to go about. Directions for the future diet must be given; this should be along the lines laid down in the section on Obesity.

In thin, anemic, exhausted women, who are the ones usually treated, the diet is as follows: The patient is put to bed and the diet gradually changed from the ordinary diet to a milk diet. This is done by giving from three to four ounces of milk every two hours, after the Karell method. Then the patient is given two quarts of milk in each twenty-four hours. The amount is divided, and a portion given at three-hour intervals. At the end of the first week a pound of beef is administered in the form of a raw soup. This is given three times a day, one pound of beef being used each day. If desired, this may be replaced by peptonized food. (See formulas in the Appendix.)

After ten days three meals a day are given. These are led up to gradually, and the patient is kept on the milk diet until the stomach feels comfortable. Then, usually within from four days to a week a light breakfast is allowed, and in a few days more a chop is given

at the midday meal. After a short time the patient is given three full meals, together with three or four pints of milk instead of water, either with or after the meals.

After about ten days of this treatment from two to four ounces of a good fluid extract of malt are given before each meal. "As to meals, I leave them to the patient's caprice, unless this is too unreasonable; but I like to give butter largely, and have little trouble in having this most wholesome of fats taken in large amounts. A cup of cocoa or of coffee and milk on waking in the morning is a good preparation for the fatigue of the toilet."

In some of the difficult cases half an ounce of cod-liver oil is given half an hour after each meal. If it causes nausea or interferes with the appetite, it is given as a rectal injection. This is of particular service where the bowels are sluggish. It may also be given in the form of an emulsion with pancreas extract. In some it acts admirably; in others it may cause tenesmus.

Alcohol is not necessary to the treatment, and, as a rule, is omitted, although a small amount helps in the accumulation of fat. It should always be used with great care and judgment. In those who have never taken it to excess or used it habitually Mitchell gives it in small daily doses. An ounce of whisky in milk or a glass of red wine or champagne he regards as a useful adjuvant, as it increases the desire to take food at meals. In some even the small amount contained in malt extract may cause excitement, and for these cases the thicker malt extracts or the Japanese extract, which is made from barley and rice, are prescribed.

Iron is given in large doses as soon as the patient begins to take solid food, and sometimes before. The form is not of as much importance as the dosage. The carbonate and the lactate are the forms prescribed by Mitchell. If the patients claim that they can not take iron, five grains of the pyrophosphate are added to each ounce of malt, and it is given without their knowledge. It is generally well borne, and after a month's time it may usually be given with good results in the ordinary forms. The peptonates of iron and manganese may also be administered either with or without malt. No other drugs are given except as needed to regulate the bowels—cascara, aloes, etc. When the patient begins to sit up, strychnin in full doses with iron and arsenic is given.

SCHEDULE FOR A COMPLETE REST-CURE.

Until otherwise ordered, absolute rest in bed. No visitors, no reading, and no conversation with nurse on the subject of disease or treatment.

First Day.—1 quart of milk in divided doses every two hours. 8 A. M.: Cold bath followed by a brisk rub. If patient does not react well, a warm bath may be used for several days and then the cold bath tried again. 11 A. M.: 20 minutes' massage. 2–3.30 P. M.: Room darkened for a nap. 4 P. M.: 20 minutes electricity. 9 P. M.: Brisk rub over entire body.

Second Day.—Same as first. Milk 1½ quarts; massage and electricity increased to 40 minutes.

Third Day.—2 quarts of milk in divided doses at 3-hour intervals; massage and electricity 1 hour each.

Fourth Day.—Same with addition of white of a raw egg with each glass of milk; cup of cocoa on awakening.

Fifth Day.—Same with addition of raw-beef soup or broth, 1 pint in two portions; a slice of toast.

Ninth Day.—Same with soft-boiled eggs and toast for breakfast.

Tenth Day.—Same with a chop, potato and junket for dinner—about 1.30 P. M.

Twelfth Day.—Cocoa on awakening. 7.30 A. M.: Bath and brisk rub. 8.30 A. M.: Breakfast, including cereal, chop or eggs, bread and butter, and two glasses of milk with the whites of two eggs. 10–11 A. M.: Massage. 11.30 A. M.: ½ Pint milk, whites of one or two eggs. 2 P. M.: Full dinner, including two glasses of milk and whites of two eggs 3.34–4 P. M.: Electricity. 5.00 P. M.: Glass of milk with whites of two eggs. 7.30 P. M.: Supper including milk and eggs. 9.30 P. M.: Brisk rub and a glass of milk.

Schedule as above until desired effect is obtained. This to be modified to suit the individual case. On twelfth day it is well to give two ounces of malt extract with a teaspoonful of solution of peptonate of iron and manganese. Hydrochloric acid, pepsin, and nux vomica are useful if there is discomfort after eating. Bowels to be kept open. Use butter in as large quantities as possible.

The following is a sample schedule[1] in a marked case in a patient of thirty-three:

"Patient remained in bed in entire repose. She was fed, and rose only for the purpose of relieving the bladder and rectum.

"Oct. 10th: Took one quart of milk in divided doses every two hours.

"11th: A cup of coffee on rising and two quarts of milk in divided portions every two hours. A pill of aloes every night, which answered for a few days.

"12th–15th: Same diet. The dyspepsia by this time was relieved, and she slept without the habitual dose of chloral. The pint of raw soup was added, in three portions, on the 16th.

"17th and 18th: Same diet.

"19th: She took, on awaking at 7, coffee; at 7.30 half-pint of milk; and the same at 10 A. M., 12 M., 2, 4, 6, 8, and 10 P. M. The soup at 11 A. M., and at 5 and 9 P. M.

"23d: She took for breakfast an egg and bread and butter; and two days later (25th) dinner was added, and also iron.

"On the 28th this was the schedule: On waking, coffee at 7. At 8, iron and malt. Breakfast, a chop and bread and butter; of milk, a tumbler and a half. At 11, soup. At 2, iron and malt. Dinner closing with milk, one or two tumblers. The dinner consisted of anything she liked, and with it she took six ounces of Burgundy or dry champagne. At 4 soup. At 7, malt, iron, bread and butter, and usually some fruit, and commonly two glasses of milk. At 9, soup; at 10, an aloe pill. At 12 M., massage occupied an hour; at 4.30 P. M., electricity was used for an hour.

"This diet-list, reached in a few days by a woman who had been

[1] Fat and Blood, p. 146.

unable to digest the lightest meal with comfort, seemed certainly remarkable. She began to gain at the end of the second week; the effect was noticed in her face, and during her two months in bed she went from 96 pounds to 136, and the gain in color was not less marked. At the sixth week the soup was dropped, wine abandoned, the iron lessened one-half, the massage and electricity used on alternate days, and the limbs exercised as I have described. The usual precautions as to rising and exercise were carefully attended to, and at the end of the ninth week of treatment my patient took a drive. At this time all mechanical treatment ceased, the milk was reduced to a quart, the iron to five grains three times a day, and the malt continued. At the end of six weeks I began to employ strychnin in doses of one-thirtieth of a grain thrice a day at meals, and this was kept up for several months, together with the iron and malt. The cure was complete and permanent.''

The patient is allowed to undertake movements for herself very gradually, being allowed to move about in the bed by herself and then sit up, and later on to sit out-doors, and then to walk a few steps, to take a drive, etc. If this is not done gradually, the moving about may be attended by dizziness, vertigo, or unpleasant exhaustion, which may be avoided entirely by gradually increasing the patient's efforts for herself.

Asthenopia is a most troublesome symptom, and patients who do not exhibit it generally make good recoveries. Where it exists, an ophthalmologist should be consulted. The eye trouble may persist long after all other symptoms have disappeared.

The following schedule,[1] abridged from Mitchell, is instructive as showing the method of treating a man who continued at his business while undergoing the treatment. The patient was fifty-three years old, and had broken down after thirty years of constant application to business. He had a cough, was greatly emaciated, and exhibited numerous nervous symptoms.

''6 A. M.: A tumbler of strong beef-tea made from the Australian extract.

''8 A. M.: Half a tumbler of iron water and breakfast, consisting of fruit, steak, potatoes, coffee, and a goblet of milk.

''8.30 A. M.: A goblet of milk mixed with a dessertspoonful of Loefland's extract of malt, with six grains of citrate of iron and quinin.

''10 A. M.: Electricity.

''12 M.: Dressed with as little personal effort as possible; a second goblet of iron and malt was given him, and a carriage took him to his office, where he remained two hours, a carriage bringing him back. Walking was forbidden. He was then given dinner, preceded by half a tumbler of iron water. After dinner, which included a goblet

[1] Fat and Blood, p. 172.

of milk, the third goblet of milk and malt was swallowed. Then a short drive might be taken. By 4 o'clock the patient must be undressed and in bed.

"6 P. M.: The third dose of iron water and a light supper of fruit, bread and butter, and cream, followed by a fourth goblet of milk and malt. Two quarts of milk were given in addition to the other food.

"9 P. M.: Massage for one hour, followed by beef-soup, four ounces.

"From 125 pounds he went up in six weeks to 133 pounds, and reached 140 a month and a half later, and has continued to gain. A year later he was well and strong, and had ceased to be what he had been for years—a delicate man."

DIET FOR THE INSANE

Feeding constitutes a very important part of the treatment of the insane. *All insane patients who are below the standard of nutrition should be built up, and an earnest effort made to increase the weight of the patient.* One of the English alienists was wont to talk of the "gospel of fatness." This is best accomplished by a system of feeding somewhat similar to that outlined in the rest treatment, the rest being prescribed or omitted as the case demands. It should always be remembered that an insane person may contract other diseases besides his mental disorder, and these should be carefully sought for and properly treated; this is true especially of stomach and intestinal disorders, which may give rise to delusions regarding the taking of food.

When the patient refuses food, the question as to the advisability of feeding him by force arises; opinions are divided on this point. Everything considered, it is well to begin the forced feeding early, before the patient has time to suffer from his fasting. It should be accomplished by means of the stomach-tube or the nasal tube, and about a liter (1 quart) of food should be introduced. The food may be given thus twice daily, and in the case of weak patients three or four times a day. Milk, milk and eggs, and broths may be used for this purpose. A sufficient number of attendants should be at hand to control the patient if he becomes unruly and resists feeding. After a patient has been fed with the tube several times he will often prefer to take his nourishment in the usual manner.

Whether the esophageal or the nasal tube is to be used will depend on the preference of the physician. Each has its advantages. The nasal tube is generally preferred, since it is easier to introduce, can not be bitten by the patient, and does not cause the patient to struggle as much as the stomach-tube; it may, however, be passed into the larynx, and in this way liquid might be introduced into the trachea. This danger is more fancied than real, and can be avoided if the patient is allowed to breathe before the fluid is poured into the tube.

While he is breathing the tube should be pinched, and if it is in the larynx, this fact will be noticed at once. Ordinarily, but not always, coughing ensues; it does not follow when the larynx is anesthetic, as it occasionally is in the insane or hysteric. The stomach-tube does not allow the food to be regurgitated so easily as the nasal tube, but for this method of feeding a mouth-gag is required that may injure the mouth or teeth, or it may slip, permitting the patient to bite the tube. If the patient has acquired the knack of regurgitating the food, this may be prevented by tickling the ribs while the fluid is being introduced. This prevents the fixing of the diaphragm, and is successful in most cases.

Tact and experience in handling the insane are of the greatest value. Some nurses or attendants have little difficulty in getting patients to eat, whereas others seem never to learn how to manage them. It must be remembered that an insane patient may not eat for reasons that are often easily overcome. He may prefer to take his food alone, because he does not think himself worthy of eating at the same table or with other people. He may fear that his food has been poisoned, and he should be convinced of the fallacy of this by the nurse who should eat a portion before him, or allow him see the food prepared, or he may be given food that can not easily be poisoned, such as eggs, whole vegetables, and fruit. When the patient's confidence is gained, the battle is generally won. In some cases the delusion persists for a long time and can not be dispelled.

Food should always be served daintily. An insane person who may be very much unbalanced may still notice the slightest variations in the way of serving food. Attendants are apt to be negligent in this respect. For all patients who have a suicidal tendency the food should be served on dishes that can not be broken. No knives should be allowed, and the food should be so served as to require no cutting. An attendant should watch those who are apt to bolt their food, and see that it is cut fine before serving it. Cases of sudden death have followed the drawing of a piece of meat into the larynx while eating too rapidly.

Children of very nervous parents and those whose constitutions are of the nervous type require careful dietetic supervision, and the child should be trained to like the plain and wholesome varieties of food, and never be given the rich, highly seasoned dishes that so often disturb the digestion of nervous children. Milk should form the basis of the diet, and eggs and meat should be given in moderate quantities along with cereals and the wholesome vegetables. As a rule, infants should be kept on a milk diet for a longer period than other children, and the change to a general diet should be made with caution. Tea and coffee, as well as alcohol, should always be forbidden. Every effort should be made to nourish the child, and to have him lead a wholesome, quiet, out-of-door life.

DISEASES IN WHICH DIET IS A PRIMARY FACTOR

DIABETES

Diabetes is a disease of the greatest interest to the student of dietetics, for it is by the regulation of the diet that the diabetic's life is made comfortable, his days prolonged, and the progress of his disease arrested. The recent addition of insulin in the treatment does not change the truth of this statement, inasmuch as a patient under insulin treatment needs a more carefully controlled diet than one in which it is not indicated.

Diabetes is a disease characterized by lessened ability to utilize sugar and by a more or less profound disturbance of the whole metabolism. The unutilized sugar is excreted in the urine. There is in normal urine a minimal amount of sugar constantly present, to be detected by refined tests; this is known as *physiological glycosuria. Temporary glycosuria* may be induced by drugs (phlorizin, etc.), injury, or excitement. Some persons show a marked tendency to the exhibition of an *emotional glycosuria* associated with hyperexcitability of suprarenal function. *Alimentary glycosuria* may result in normal individuals from the ingestion of excessive amounts of sugar. No constant etiologic connection can be demonstrated between any of these phenomena and diabetes mellitus.

The reader is referred to the text-books on medicine for an account of the disease, but it may be observed that it may be a familial disease to a certain extent, and that such cases present a rather better prognosis. Excesses in diet, particularly as regards carbohydrates, seem to play a part in the causation of the disease, and members of diabetic families should be cautioned in this regard.

It may be stated that the severity of a case of diabetes usually varies in inverse ratio to the age of the patient: where the first finding of sugar occurs in a patient under thirty the case may ordinarily be considered severe and the outlook bad; if sugar is found for the first time in an individual over sixty the diabetes may be expected to have no effect on the duration of life. But to this there are many exceptions; cases of marked mildness occur in the obese young, and we have seen rapidly fatal cases in the aged. There is also a clinically typical diabetes occurring in children, which is later outgrown. This condition, however, is quite rare. In a typical case of diabetes, untreated, or unintelligently treated, the clinical course is something like the following: the patient notes polyuria, an excessive and urgent thirst and hunger, large quantities of sugar may be found in the urine, there is rapid and progressive loss of weight, the patient is incapacitated for his usual activities, cramps occur in the muscles of the extremities, intense itching may be a symptom; any infection falls upon fertile ground and runs a rapid course, furunculosis is especially common; shortly the patient's breath acquires an odor as of rotting

fruit, there is a slowing and drowsiness, perhaps nausea and vomiting, the patient sinks into coma with marked desiccation and air-hunger breathing, and death terminates the train of events.

Although the inability to normally utilize sugar is the most characteristic failure of metabolic function, it is not the only defect of the vital chemistry, nor that fraught with most danger to the patient. In the normally functioning body the amino-acids derived from the fat and protein of the food ingested, as well as from the breaking down of the fat and protein of the body tissues, are burned with the carbohydrates to water, carbon dioxid, and ammonia (excreted mostly as urea) as end products. As Bunge said, the fats are burned in the flame of the carbohydrates, and where the available carbohydrate is insufficient (as in fasting, toxic vomiting, diet containing excessive amounts of fat and protein, or, as in diabetes, where, whatever the sugar intake, sufficient sugar cannot be utilized), these fatty acids break down into β-oxybutyric acid, diacetic acid, and acetone. Since the two last are products of the first, acetone is earliest found in the excretions when this process, called acidosis, occurs. The production of these ketone bodies is in itself relatively innocent; the finding of acetone, or even of diacetic acid, in the urine does not indicate the presence of a clinically significant acidosis. But, since the hydrogen ion concentration of the blood and tissues must be maintained as a constant, these acid bodies must be neutralized. This neutralization is carried on first by stores of sodium and of potassium maintained in the body by ammonia withdrawn from the urea synthesis, and even, to some extent, by the protein of the body. No symptoms occur until the power of the blood plasma to combine with carbon dioxid is so reduced by the withdrawal of alkali that the patient's gas interchange is seriously interfered with. The increased concentration of carbon dioxid stimulates the respiratory center, hyperpnea occurs, there is severe headache and drowsiness. Frequently vomiting, with polyuria, results in dehydration; coma follows. Joslin asserts that "the diabetic who dies of coma uncomplicated by infection dies needlessly." It is to the prevention of acidosis that the effort of those skilled in the dietetic treatment of diabetes is increasingly directed. The appearance of acetone in the urine is to the intelligent physician managing a case of diabetes what the red flag is to the locomotive engineer, a warning not to be disregarded, calling for immediate action.

Fortunately, we need not wait for the appearance of the clinical symptoms of acidosis to evaluate the significance of the appearance of ketone bodies in the urine. As has been pointed out above, these symptoms follow on the diminution of the carbon dioxid combining power of the blood-plasma, which may be accurately measured in the laboratory by the method of Van Slyke. This is done by the analysis of 1 c.c. of oxalated blood-plasma in a modification of the Haldane apparatus, with a volumetric reading of the carbon dioxid gas in combination. A finding of a carbon dioxid combining power of the plasma

of over 60 vol. per cent. permits one to feel that the patient has a good margin of safety, a finding of under 35 vol. per cent. warns us that we are faced by a serious medical emergency, and that the case requires hospital care; readings of less than 20 vol. per cent. are seldom obtained from a patient not in coma. Similar information is given us by the measurement of the carbon dioxid tension of the alveolar air, either by the method of Fridericia or by that of Mariott. The method of Mariott consists in passing a current of alveolar air from a rubber bladder, in which the patient has rebreathed air for twenty seconds through a standard solution of sodium carbonate, with phenolsulphonephthalein as an indicator. The color obtained in the aerated tube is then compared with a series of tubes containing solutions of the indicator of a known hydrogen ion concentration, and the result is read in terms of millimeters of mercury. A reading of 40 to 50 mm. is normal, tensions between 30 and 35 mm. are indicative of a mild acidosis, at 20 mm. the patient may be considered in imminent danger of coma, in acidotic coma readings may be as low as 8 or 10 mm.

It should at the present time be needless to state that no attempt should be made to treat a diabetic unless frequent and careful urinary examinations are used as a guide. It is not sufficient to determine the qualitative presence of sugar in the urine, and that this sugar is glucose, nor even to determine the percentage of sugar present. The quantity of sugar excreted in twenty-four hours gives information which can be obtained in no other way. Urinalysis in a case of diabetes should always include a search for ketone bodies, particularly for acetone. The determination of the sugar concentration of the blood is also of value, especially, as will be later pointed out, after sugar has disappeared from the urine. While the patient is showing urinary sugar, daily urinalysis should be done. The intelligent patient, or some member of the patient's family, may be taught to do this test, thus saving the physician much labor and adding markedly to his efficiency in the treatment of an ambulant case.

Diabetes mellitus was defined as a disease characterized by a lessening of the patient's ability to utilize carbohydrates. The amount of carbohydrate which in any given case can be utilized is a fairly fixed quantity, different for each patient, and subject to certain variations, but none the less definite and discoverable. The general principle to be followed in the treatment is to so arrange the patient's diet that the amount of carbohydrate taken in shall be no more than the patient can utilize. This principle is recognized in all the many schemes of diet which have been advocated in the modern treatment of diabetes, only the means adopted for obtaining this end have varied widely. The general management of the diabetic patient is such as common sense would dictate. The patient is to be assured of sufficient rest in bed—ten to twelve hours a day is an appropriate allowance. Light exercise is indicated, overindulgence in physical activity is to be

avoided. Worry and mental and emotional stress have, as would be expected, a detrimental effect on the course of the disease. The most careful personal hygiene must be observed, the mouth and skin kept cleansed with exceptional care because of the patient's liability to infection. Constipation is to be avoided, but care must be taken to avoid the occurrence of the diarrhea to which these patients are prone. Saline cathartics are contraindicated unless given for the purpose of withdrawing water. But, as has been stated above, the most important factor in treatment is the regulation of the diet, so that the patient's tolerance shall not be exceeded, the urine remain free of sugar and of acid bodies, and the blood-sugar well below that concentration at which sugar appears in the urine.

Allen advocates the following routine in the treatment of diabetes: For the first twenty-four hours the patient is kept on his usual diet in order that the amount of sugar excreted may be determined and some judgment formed as to the severity of the disease. The patient is then starved, being allowed no food whatever except black coffee, tea, or clear broths. These fluids are given every few hours and, if necessary, whisky is added. The fast is continued until the patient becomes sugar free. The carbohydrates are now gradually added to the diet at the rate of about 5 gm. every other day, until glycosuria appears. The carbohydrate is then cut down to within the patient's tolerance, and fat and protein are gradually and cautiously added. The advantages claimed for this treatment are that the patient is rapidly rendered sugar free, that much weight is lost during the starvation, and partial starvation while diet is being adjusted, and that, therefore, the patient's tolerance is increased in proportion as his body weight is reduced. The disadvantages found in practice under this method are that not all patients respond to starvation with a prompt disappearance of sugar from the urine, and that in many patients the fast, with the destruction of body fat and protein, may lead to an acidosis with fatal termination. The subsequent care of a patient under this treatment calls for careful watching of the urine and for one-day fasts whenever sugar reappears.

Joslin modifies this treatment, especially for severe, long-standing, and acidotic cases, as follows: Without otherwise changing their habits of diet, he omits fat, and after two days he omits protein, then carbohydrates are halved daily, until the patient is taking 10 gm. of carbohydrates; the fast is then undertaken and the remainder of the course of treatment is similar to the method already described. This plan of preparing the patient for the starvation period somewhat minimizes the possibility of the occurrence of acidosis. To this scheme of fasting and limitation of carbohydrate intake to within the patient's tolerance Mosenthal added the substitution of alternative foods of equal fat, protein, and carbohydrate values, thus considerably increasing the comfort of the patient. His scheme is to place the patient on a carbohydrate-low diet of known caloric value, and to increase the

carbohydrate to just within the patient's tolerance by the addition of carbohydrate foods as accessory articles of diet. Examples of his diet lists are given on the succeeding pages. In using these lists it should be remembered that they are incomplete until the carbohydrate is increased to about one-half the patient's carbohydrate tolerance. All of these diets work well with the mild diabetics, all of them are used in more severe cases with complete failure to obtain the desired results.

Starch Free Diet—(Mosenthal).

May Eat:

Soups—Clear meat broths.

Meats—All kinds of meat, fresh, smoked, or cured; except liver; all meats must be prepared without flour or breadcrumbs.

Fish—All kinds of fish, but no clams, oysters or scallops.

Eggs—Eggs in any form, prepared without milk, flour or sweetening (sugar, jam, etc.).

Butter—Butter, oil, and lard.

Cheese—All kinds of cheese.

Vegetables—Greens, spinach, string-beans, Brussels sprouts, asparagus, kohlrabi, rhubarb, egg-plant, water cress, lettuce, endive, cucumbers, celery, cabbage, mushrooms, tomatoes, sour pickles, sauerkraut, sorrel, Swiss chard, cauliflower.

Gluten Products—"Akoll" biscuits.

Desserts—Gelatin jellies (use sour white wine, brandy or coffee for flavoring).

Beverages—Tea and coffee, sweetened with saccharine (without sugar or milk); claret, burgundy, sour white wine, and whisky in moderate amounts. Vichy and water.

Condiments—Pepper, salt, mustard, oil, vinegar.

Must Avoid Eating:

Sugar in any form. Bread, biscuits, and cakes of all kinds. Toast, crackers, rice, oatmeal (and all cereals); sago, tapioca, macaroni, vermicelli, potatoes, carrots, parsnips, beets, corn, beans, peas. All fruits, fresh, preserved and dried. Jams and jellies. Pastry, puddings, and ice cream. Sauces and gravies thickened with flour.

Must Avoid Drinking:

Milks, ales, porter, stout, beer, cider, all sweet wines, port wine, liqueurs, sparkling wines, syrups.

General Diabetic Diet List.

May Take Freely:

Soups: All meat soups and broths. May add vegetables allowed, egg or cheese.

Meats: All fresh, smoked and cured meats (except liver), poultry and game, without sauces or gravies containing flour, pate de foie gras.

Fish: All kinds, except oysters, clams and scallops, cooked without bread crumbs or meal; all dried, salted, smoked or pickled fish.

Eggs: Prepared in any way without flour.

Fats: Butter, lard, suet, olive oil, or other fats.

Cheeses: All kinds, especially cream, Swiss, English, and pineapple cheese.

Vegetables and Salads: Asparagus, beet greens, Brussels sprouts, cabbage, cauliflower, celery, chicory, cresses, cucumbers, endive, egg-plant, kohl-rabi, leeks, lettuce, okra, pumpkin, radishes, rhubarb, salsify, sauerkraut, spinach, string-beans, tomatoes, vegetable marrow.

Pickles: Made from the above vegetables, unsweetened; ripe olives.

Fungi: Mushrooms and truffles.

Cream: Not over 3 ounces a day.

Condiments: Salt, pepper, cayenne, paprika, curry, cinnamon, cloves, English mustard, nutmeg, caraway, capers, vinegar, and the piquant sauces in small quantities, unless specially forbidden.

Desserts: Jellies made from gelatin; custards and ice-cream made with eggs and cream; all sweetened with saccharin and flavored with vanilla, coffee, or brandy.

Nuts: Butternuts.
Beverages: Tea or coffee, sweetened with saccharin, and with the portion of cream allowed.
Whisky, brandy, rum, and other distilled liquors, up to 3 ounces a day, light Rhine wine or Moselle wine, claret or Burgundy, up to 16 ounces a day (one pint).
Mineral waters of all kinds.
Lemonade in small quantity, sweetened with saccharin.

Articles Prohibited, Except as Prescribed in the Accessory Diet:
Sugars and sweets of every kind.
Pastry, puddings, preserves, cake and ice-cream.
Bread and biscuits of all kinds, toast, crackers and griddle cakes.
Cereals, such as rice, oatmeal, sago, hominy, tapioca and barley.
Macaroni, potatoes, carrots, parsnips, beans, peas, beets, green corn and turnips.
Fruit of all kinds, fresh or dried.
Soups, sauces or gravies thickened with flour or meal, or made with milk.
Beer, ale, porter, all sweet wines, sherry or port wine, sparkling wines, cider, and liqueurs.
Milk, chocolate or cocoa.
All sweet drinks and soda water.

GENERAL DIABETIC DIET LIST.

Allowed Freely.

1. Meat soups, broths, bouillon.
2. All fresh, smoked and cured meats, but without gravies made with flour.
3. All fresh, dried, salted or smoked fish cooked without bread crumbs or meal.
4. Eggs in any form, without flour.
5. Butter, lard, olive oil and other fats.
6. Asparagus, cabbage, cauliflower, celery, cress, egg plant, cucumbers, radishes, lettuce, okra, pumpkin, rhubarb, spinach, tomatoes, string beans, sauerkraut, mushrooms.
7. Cream, up to 3 oz. a day.
8. Condiments unless forbidden.
9. Desserts made from gelatin, custards and ice cream made with cream, eggs, and saccharin, flavored with vanilla, coffee or brandy.
10. Tea or coffee, with saccharin; distilled liquors 3 oz. a day. Mineral waters of all kinds. Rhine wine or claret, 1 pint a day.

Prohibited except as ordered.

1. Sugars and sweets of all kinds.
2. Pastry, puddings, cake, preserves.
3. Bread, biscuits, toast, cookies, crackers.
4. Rice, oatmeal, sago, hominy, tapioca, barley.
5. Macaroni, potatoes, carrots, parsnips, beans, peas, beets, green corn, turnips.
6. Fruit of all kinds, fresh or dried.
7. Milk, chocolate or cocoa.
8. Soups, sauces, or gravies, thickened with flour or meal, or made with milk.
9. Beer, ale, sherry, cider, sweet wines.
10. Sweetened drinks, soda water, etc.

If the patient remains free from sugar on such a diet starchy foods may be gradually added. For convenience it is well to have at hand lists of food showing the carbohydrate equivalents. Abstracts of these may be furnished the patient. One very convenient list shows the equivalents to one ounce, 30 grams, slices of bread. The patient may be allowed one or more slices of bread or he may substitute for any slice one of the equivalents. The urine must be watched and if any glycosuria occurs the diet must at once cut back. For a few days it may be made carbohydrate free and then increased

up to about 70 per cent. of the amount of carbohydrate at which the glycosuria occurred. From time to time the tolerance may be tested and if it is increasing the outlook is good, whereas if it is decreasing the dietary restrictions must be made greater. From the beginning of the treatment it is well to have the patient take one day a week on a carbohydrate free diet, the so-called metabolic Sunday of Von Noorden. Where the tolerance is about 50 grams of starch or better, the diet for that day may be merely chosen from the list of carbohydrate foods given above, but if the tolerance is less than this, the total intake of food must be restricted and a diet like the one given below containing 1000 calories and free from carbohydrate as suggested by Mosenthal. These fast days are of great value in keeping the tolerance up and preventing acidosis. If the patient does not become free from sugar readily he must be fasted according to the method suggested by Allen and which has revolutionized the treatment and prognosis of the disease.

DIABETES MELLITUS—THE ACCESSORY DIET OF FOODS RICH IN CARBOHYDRATES. (MOSENTHAL.)

If the patient's urine continues to be sugar-free on a "carbohydrate-free" diet of sufficient caloric value, carbohydrate-containing foods may be added and the carbohydrate tolerance of the patient be determined. In those cases able to utilize a considerable amount of starch, the accessory diet may be varied from day to day, and use may be made of the following table, which gives the carbohydrate equivalent of one slice (1 ounce or 30 grams) of white bread, containing approximately 15 grams of starch.

Foods.	Household Measure.	Gm.
Uncooked Flours, etc.:		
Barley	1 h. tbsp.	21
Buckwheat	1 "	19
Cornmeal	1 "	20
Farina	1 "	20
Hominy	1 "	18
Macaroni	1 "	20
Noodles	1½ "	20
Oatmeal	1 "	22
Rice	1 "	18
Rye flour	1 "	18
Spaghetti	1½ "	20
Vermicelli	1½ "	21
Wheat flour	1 "	20
Bread and Crackers:		
Bread	1 slice	30
Breakfast biscuit (Huntley & Palmer)	3	18
Cornbread	1 slice	32
Roll (Vienna)	½	25
Uneeda Biscuit	3	18
Zwieback	1½	20
Cooked Cereals:		
"Force"	5 h. tbsp.	18
Farina	2½ "	125
Grapenuts	1½ "	20
Hominy	1½ "	90

Foods.	Household Measure.	Gm.
Cooked Cereals:		
Macaroni	1 h. tbsp.	100
Oatmeal	2½ "	130
Rice	½ "	60
Shredded Wheat Biscuit	¾ "	22
Cooked Vegetables:		
Artichokes	1 medium	320
Beans (baked—canned)	2 h. tbsp.	75
Beans, lima	1¼ "	50
Beets	6 "	200
Carrots	13 "	440
Okra	4 "	200
Onions	3	300
Parsnips	4 slices	120
Peas, green	3 h. tbsp.	100
Potato (baked)	½ medium	60
Potato (boiled)	½ medium	70
Potato (mashed)	1½ h. tbsp.	80
Potato, sweet (boiled)	½ medium	35
Squash	2 h. tbsp.	100
Turnips	3 "	210
Fruits:		
Apple	1 medium	120
Apricots	2 large	120
Banana (without skin)	½ medium	75
Cherries	......	90
Currants	5 h. tbsp.	120
Grapefruit	½ small	150
Huckleberries	3½ h. tbsp.	90
Lemons	2 medium	210
Muskmelon	⅓	300
Nectarine	1	100
Olives, green	20	180
Orange	½ large	150
Peaches	1½ medium	150
Pear	1 small	100
Pineapple	3 slices	150
Plums	2 medium	75
Raspberries	4½ h. tbsp.	120
Strawberries	8 "	200
Watermelon	Large slice	300
Dried Fruits:		
Apples	3 small	22
Apricots	3 large	24
Currants	1½ tbsp.	20
Dates	3	19
Figs	1 large	12
Prunes	2 "	24
Raisins	10 "	23
Milk and Cream:		
Buttermilk	1½ tumbler	300
Cream, 16 per cent.	1½ "	300
Cream, 40 per cent.	1½ "	300
Kumiss	1½ "	300
Whole milk	1½ "	300
Nuts:		
Almonds	60	90
Brazil	30	180
Chestnuts (roasted)	15	40
Cocoanut	1 slice (3 x 2 in.)	50
Filberts	100	100
Peanuts	40	80
Pecans	35	110
Pistachio	190	95
Walnuts	30	125

Joslin gives the following lists which are of especial value:

STRICT DIET., MEATS, FISH, BROTHS, GELATINE, EGGS, BUTTER, OLIVE OIL, COFFEE, TEA AND CRACKED COCOA.

Foods arranged approximately according to per cent. of Carbohydrates.

VEGETABLES 5 per cent.		10 per cent.	15 per cent.	20 per cent.
Lettuce Spinach Sauerkraut String beans Celery Asparagus Cucumbers Brussels sprouts Sorrel Endive Dandelions Swiss chard Sea kale	Cauliflower Tomatoes Rhubarb Egg plant Leeks Beet greens Water cress Cabbage Radishes Pumpkin Kohl-rabi Broccoli Vegetable marrow	Onions Squash Turnip Carrots Okra Mushrooms Beets	Green peas Artichokes Parsnips Canned lima beans	Potatoes Shell beans Baked bea Green corn Boiled rice Boiled macaroni
FRUITS Ripe olives (20 per cent. fat) Grape fruit		Lemons Oranges Cranberries Strawberries Blackberries Gooseberries Peaches Pineapple Watermelon	Apples Pears Apricots Blueberries Cherries Currants Raspberries Huckleberries	Plums Bananas
NUTS Butternuts Pignolias		Brazil nuts Black walnuts Hickory Pecans Filberts	Almonds Walnuts (Eng.) Beechnuts Pistachios Pinenuts	Peanuts 40 per cent. Chestnuts
MISCELLANEOUS Unsweetened and unspiced pickles, clams, oysters, scallops, liver, fish roe.		Reckon *actually available* carbohydrates in vegetables of 5 per cent. group as 3 per cent., of 10 per cent. group as 6 per cent.		

CONTAIN APPROXIMATELY	Protein.	Fat.	Carbohydrates, Grams.	Calories.
Oatmeal, dry weight	5	2	20	110
Meat (uncooked)	6	2	0	40
Meat (cooked)	8	3	0	60
Broth	0.7	0	0	3
Potato	1	0	6	30
Bacon (cooked)	5	15	0	155
Cream, 40 per cent.	1	12	1	120
Cream, 20 per cent.	1	6	1	60
Milk	1	1	2	20
Bread	3	0	18	90
Butter	0	25	0	240
Egg (one)	6	5	0	75
Brazil nuts	5	20	2	210
Orange (one)	0	0	10	40
Grapefruit (one)	0	0	10	40
Vegetables, 5-10 per cent. groups	0.5	0	1	6

1 gram protein, 4 calories.
1 gram fat, 9 calories.
6.25 grams protein contain 1 gram nitrogen.
30 grams (g) or cubic centimeters (c.cm.) = 1 ounce.
1 gram carbohydrate, 4 calories.
1 gram alcohol, 7 calories.
1 kilogram = 2.2 pounds.
A patient "at rest" requires 25 to 30 calories per kilogram body weight.

VEGETABLES.

In order of their Carbohydrate Contents, from lowest to highest.

EDIBLE PORTION	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Calories, per 100 Gms.
Cucumbers, fresh	0.8	0.2	2.5	15
Cucumber pickles	0.5	0.2	2.5	15
Asparagus, canned	1.5	0.1	2.8	19
Celery, fresh	1.4	0.0	3.0	18
Endive, fresh	1.0	0.0	3.0	16
Spinach, fresh	2.1	0.5	3.1	26
Asparagus, fresh	1.8	0.2	3.3	22
Lettuce, fresh	1.3	0.4	3.3	22
Brussels sprouts, canned	1.5	0.1	3.4	21
Brussels sprouts, fresh	1.4	0.1	3.5	21
Olives, ripe	1.4	21.0	3.5	215
Okra, canned	0.7	0.1	3.6	18
Rhubarb, fresh	0.6	0.7	3.6	24
Sorrel, fresh	0.7	0.7	3.7	25
Watercress, fresh	0.7	0.7	3.7	25
String beans, canned	1.1	0.1	3.9	23
Tomatoes, fresh	0.8	0.4	3.9	23
Tomatoes, canned	1.2	0.2	4.0	23
Sauerkraut	1.5	0.8	4.4	32
Artichokes, canned	0.8	0.4	5.0	24
Eggplant, fresh	1.2	0.2	5.1	29
Pumpkin, fresh	1.0	0.1	5.2	27
Kohl Rabi, fresh	2.0	0.1	5.5	33
Cabbage, fresh	2.1	0.4	5.8	36
Cauliflower, fresh	1.6	0.8	6.0	39
Radishes, fresh	1.3	0.0	6.6	33
Pumpkin, canned	0.8	0.2	6.7	33
Mushrooms, fresh	3.5	0.4	7.0	46
Okra, fresh	1.6	0.2	7.4	39
Turnips, fresh	1.3	0.2	8.1	40
Olives, green	0.8	20.2	8.5	226
Oyster plant, fresh	4.3	0.3	8.8	56
Squash, fresh	1.7	0.5	9.0	49
Carrots, fresh	1.1	0.4	9.2	45
String beans, fresh	2.2	0.4	9.4	51
Beets, fresh	1.6	0.1	9.7	46
Green peas, canned	3.6	0.2	9.8	57
Onions, fresh	1.7	0.4	9.9	52
Squash, canned	0.9	0.5	10.5	51
Green peas, fresh	7.0	0.5	16.0	99
Parsnips, fresh	1.6	0.5	16.5	80
Artichokes, fresh	2.6	0.2	16.7	81
Potatoes, fresh	2.2	0.1	18.4	81
Green corn, canned	2.8	1.3	19.3	103
Green corn, fresh	3.0	1.1	19.7	103
Potatoes, boiled	2.5	0.1	20.9	97

FRUITS.

In order of their Carbohydrate Contents, from lowest to highest.

Edible Portion	Protein, per cent.	Fat, per cent.	Carbo-hydrate, per cent.	Calories, per 100 Gms.
Grapefruit			5.0	20
Watermelon	0.4	0.2	6.7	31
Strawberries	1.0	0.6	6.8	38
Alligator pears	1.0	10.2	6.8	127
Lemons	1.0	0.6	8.5	45
Muskmelons	0.6	0.0	9.3	40
Peaches	0.7	0.1	9.4	42
Pineapple	0.4	0.3	9.7	44
Blueberries	0.1	0.3	9.8	43
Lemon juice			9.8	40
Cranberries	0.4	0.6	9.9	48
Blackberries	1.3	1.0	10.9	60
Oranges	0.8	0.2	11.6	53
Raspberries	1.7	1.0	12.6	69
Gooseberries	1.0	0.0	13.1	58
Apricots	1.1	0.0	13.4	60
Whortleberries	0.7	3.0	13.5	80
Pears	0.6	0.5	14.1	65
Apples	0.4	0.5	14.2	65
Huckleberries	0.6	0.6	16.6	76
Cherries	1.0	0.8	16.7	80
Grapes	1.3	1.6	19.2	100
Bananas	1.3	0.6	22.0	101

NUTS.

In order of their Carbohydrate Contents, from lowest to highest.

Edible Portion	Protein, per cent.	Fat, per cent.	Carbo-hydrate, per cent.	Calories, per 100 Gms.
Butternuts	27.9	61.2	3.5	698
Pinenuts (Pignolia)	34.0	50.0	6.0	630
Brazil nuts	17.0	67.0	7.0	720
Filberts	15.6	65.3	13.0	725
Hazel nuts	18.0	64.0	14.0	720
Pecans	9.6	70.5	15.3	757
Almonds	21.0	55.0	20.0	668
Peanuts	25.8	38.6	24.4	565

FISH.

In order of their Carbohydrate Contents, from lowest to highest.

Edible Portion	Protein, per cent.	Fat, per cent.	Carbo-hydrate, per cent.	Calories, per 100 Gms.
Shad roe	20.9	3.8	2.6	130
Shell Fish, etc.				
Crabs	16.6	2.0	1.2	101
Clams	8.6	1.0	2.0	53
Oyster, solids	6.0	1.3	3.3	51
Scallops	14.8	0.1	3.4	75

MEATS.

Edible Portion	Protein, per cent.	Fat, per cent.	Carbo-hydrate, per cent.	Calories, per 100 Gms.
Bacon	10.0	67.2		666
Bacon, crisp	10.0	0.0		41
Beef, round, very lean, fresh	20.8	5.8		135
Chicken, fresh	22.8	1.8		110
Ham, very lean	20.2	20.8		276
Lamb, very lean, fresh	19.1	12.4		193

Edible Portion	Protein, per cent.	Fat, per cent.	Carbo-hydrate, per cent.	Calories, per 100 Gms.
Mutton, very lean, fresh	19.1	12.4		193
Pork, lean, fresh	19.0	13.0		199
Veal, very lean, fresh	21.0	3.6		120
FISH.				
Bass, fresh	20.6	2.0		103
Bluefish, fresh	19.0	1.2		90
Cod, fresh	15.8	0.4		70
Flounder, fresh	13.9	0.6		62
Halibut, fresh	18.4	5.2		124
Salmon, fresh	22.0	12.8		213
Shad roe, fresh	20.9	3.8	2.6	130
Shad, whole, fresh	18.8	9.5		165
DAIRY PRODUCTS, ETC.				
As Purchased				
Edible Portion				
Butter		82.4		765
Cheese, American, pale	28.8	35.9		452
Brie	15.9	21.0	1.4	266
Cream, Imt'n full	25.9	31.7		401
Roquefort	22.6	29.5	1.8	375
Swiss	27.6	24.9		443
Cream				
Very thick		50.0	4.4	483
Average	2.5	18.5	4.5	201
Milk				
Whole	3.3	4.0	5.0	71
Skimmed	3.4	0.3	5.1	37

Caloric Equivalent of 10 gms. of Steak in Carbohydrate-Free Meat or Fish.

Food	Gms.	Fat, gms.	Protein, gms.	Calories.
Steak	10	1.0	2.4	19
Roast beef	5	1.4	1.1	18
Tongue	7	1.4	1.6	20
Lamb chop	5	1.5	1.1	18
Roast lamb	8	1.3	1.6	20
Sweetbreads	11	0.1	4.4	19
Boiled ham	7	1.4	1.5	19
Fried ham	5	1.7	1.1	20
Roast pork	9	0.9	2.6	19
Bacon	9	1.7	0.9	20
Chicken	11	1.0	2.4	19
Duck	9	1.3	1.8	19
Guinea hen	12	0.8	2.8	19
Squab	9	1.1	2.1	19
Turkey	7	1.3	2.0	20
Bluefish	13	0.6	3.5	20
Halibut	16	0.7	3.3	20
Mackerel	15	1.0	2.5	20
Sardines in oil	7	1.4	1.6	20

Vegetables Allowed on "Carbohydrate-Free" Diet.

Asparagus
Brussels sprouts
Cabbage
Cauliflower
Celery
Cucumbers
Egg-plant
Endive
Greens
Kohl-rabi
Lettuce
Pickles (sour)
Rhubarb
Sauerkraut

Sorrel	Swiss chard
Spinach	Tomatoes
String-beans	Water-cress

Approximate Equivalent in Alcohol of 30 c.c. (1 ounce) of Whisky in Liquors Containing 2% or Less of Carbohydrate.

	C.c.	Household Measure.
Gin, rum, brandy	30	2 Tbsp.
Claret, Burgundy, Hock, Rhine and Moselle wines..	130–160	⅗ Tumbler

Mosenthal has devised some lists which contain specified amounts of protein and are free from carbohydrates. They should not be used one after the other, but the change from one to the next made gradually.

These diets were constructed after studying the nitrogen balance on patients on a carbohydrate-free diet. Mosenthal believes that not only should the patient be kept sugar and acid free, but the nitrogen equilibrium must also be maintained. With the carbohydrates eliminated from the diet, except as contained in green vegetables, it was found that in order to furnish food that was palatable over long periods of time the number of grams of fat must be near or equal the number of grams of protein. In the average individual it was found possible to get nitrogen equilibrium on a diet of from 1500 to 1700 calories and the practical deduction is that slightly over these amounts should be ingested on a carbohydrate free diet and if the tolerance of the patient permits, additional carbohydrate should be added.

THE JOHNS HOPKINS HOSPITAL

STANDARD CARBOHYDRATE-FREE DIET.

Diabetes Mellitus.

	Alcohol, gms.	Protein, gms.	Nitrogen, gms.	Fat, gms.	Carbohydrate, gms.	Total Calories.
Breakfast:						
2 eggs		13.2	2.1	12.		166
Ham, 90 gms.		18.2	2.9	20.2		262
Coffee, with 45 gms. cream		1.1	.2	8.3	2.0	91
Butter, 15 gms. to be used in cooking ... Eggs if no biscuit or bread is taken.		.1	Trace	12.8		119
Dinner:						
Any clear soup		3.0	.5	Trace		12
2 Meat or fish, 200 gms.		40.0	6.4	40.0		536
1 Green vegetable from list as desired		Trace	Trace	Trace	Trace	15
Salad with 15 gms. of oil in dressing		Trace	Trace	15.0	Trace	150
Cream cheese, 30 gms.		5.4	.9	11.1	.7	129
3 Whiskey, 30 c.cm. ..	12					83
Demitasses of coffee						
Butter, 30 gms. on fish, meat and green vegetables if no biscuit or bread is taken ..		.2	Trace	25.6		238

	Alcohol, gms.	Protein, gms.	Nitrogen, gms.	Fat, gms.	Carbohydrate, gms.	Total Calories.
Supper:						
[2] Meat or fish, 120 gms.		24.0	3.8	24.0		321
[1] Green vegetable from list as desired		Trace	Trace	Trace	Trace	15
[3] Whiskey, 30 c.cm. ..	12					83
Butter, 15 gms. with green vegetables, meat or fish if no biscuit or bread is taken		.1	Trace	12.8		119
Tea with 15 gms. cream		.4	Trace	2.8	0.7	30
Bedtime:						
Bouillon with 1 raw egg		9.6	1.5	6.0		95
	24	115	18	191	4	2564

[1] Vegetables allowed. (These may be prepared or served with pepper, salt, mustard, oil, vinegar, butter or any fat.) Asparagus, beet-greens, Brussels sprouts, cabbage, cauliflower, celery, chicory, cucumbers, egg-plant, endives, kohl-rabi, leeks, lettuce, okra, pumpkin, radishes, rhubarb, salsify, sauerkraut, spinach, string-beans, tomatoes, vegetable marrow.

[2] Stew or liver are not to be served as "meat" in this diet. No sauces or gravies thickened with flour are allowed.

[3] Instead of 30 c.cm. of whiskey, 30 c.cm. of brandy or 120 c.cm. of claret or sour white wine may be used.

Carbohydrate-Free Diet, 500 Calories.

FOOD	Gms. or c.cm.	Protein, gms.	Fat, gms.	C-H., gms.	Calories.	Calories per Meal.
Breakfast:						
One egg	50	6.6	6.0	0	83	
Bacon [1]	40	4.2	7.6	0	88	
Black coffee						171
Dinner:						
Broth	150	3.3	0.3	0	16	
Steak [2]	40	9.4	4.1	0	77	
Vegetables [3]	200	2.0	0	6.0	33	
Butter	5	0.1	4.3	0	40	
Black coffee						166
Supper:						
Broth	150	3.3	0.3	0	16	
Steak [2]	40	9.4	4.1	0	77	
Vegetables [3]	200	2.0	0	6.0	33	
Butter	5	0.1	4.3	0	40	
Plain tea						166
		40.4	31.0	12.0		503

[1] The bacon is weighed uncooked. The fat and protein content is calculated for the cooked product.

[2] The caloric equivalent of other carbohydrate-free meat or fish should be frequently substituted from the accompanying list, to furnish variety in the diet.

[3] Two or three different vegetables should be chosen from the accompanying list, which tabulates the vegetables containing 5% or less of carbohydrates.

Carbohydrate-Free Diet, 1000 Calories.

FOOD	Gms. or c.cm.	Protein, gms.	Fat, gms.	C-H., gms.	Calories.	Calories per Meal.
Breakfast:						
Eggs (2)	100	13.2	12.0	0	166	
Bacon [1]	50	5.3	9.6	0	111	
Butter	5	0.1	4.3	0	40	
Black coffee						317
Dinner:						
Broth	150	3.3	0.3	0	16	
Steak [2]	100	23.9	10.2	0	193	
Vegetables [3]	200	2.0	0	6.0	33	
Olive oil	10	0	10.0	0	93	
Butter	10	0.1	8.6	0	80	
Black coffee						415
Supper:						
Broth	150	3.3	0.3	0	16	
Steak [2]	75	17.9	7.7	0	145	
Vegetables [3]	200	2.0	0	6.0	33	
Butter	10	0.1	8.6	0	80	
Tea (plain)						274
		71.2	71.6	12.0		1006

[1] The bacon is weighed uncooked. The fat and protein content is calculated for the cooked product.

[2] The caloric equivalent of other carbohydrate-free meat or fish should be frequently substituted from the accompanying list, to furnish variety in the diet.

[3] Two or three different vegetables should be chosen from the accompanying list, which tabulates the vegetables containing 5% or less of carbohydrates.

Carbohydrate-Free Diet, 1500 Calories.

FOOD	Gms. or c.cm.	Protein, gms.	Fat, gms.	C-H., gms.	Calories.	Calories per Meal.
Breakfast:						
Eggs (2)	100	13.2	12.0	0	166	
Bacon [1]	60	6.4	11.5	0	133	
Butter	10	0.1	8.6	0	80	
Black coffee						379
Dinner:						
Broth	150	3.3	0.3	0	16	
Steak [2]	140	33.5	14.3	0	270	
Vegetables [3]	200	2.0	0	6.0	33	
Cream cheese	20	5.2	6.7	0.5	86	
Olive oil	15	0	15.0	0	140	
Butter	15	0.2	12.9	0	120	
Black coffee						665
Supper:						
Broth	150	3.3	0.3	0	16	
One egg	50	6.6	6.0	0	83	
Steak [2]	100	23.9	10.2	0	193	
Vegetables [3]	200	2.0	0	6.0	33	
Butter	15	0.2	12.9	0	120	
Tea (plain)						445
		99.9	110.7	12.5		1489

[1] The bacon is weighed uncooked. The fat and protein content is calculated for the cooked product.

[2] The caloric equivalent of other carbohydrate-free meat or fish should be frequently substituted from the accompanying list, to furnish variety in the diet.

[3] Two or three different vegetables should be chosen from the accompanying list, which tabulates the vegetables containing 5% or less of carbohydrates.

Carbohydrate-Free Diet, 2000 Calories.

FOOD	Gms. or c.cm.	Protein, gms.	Fat, gms.	C-H., gms.	Calories.	Calories per Meal.
Breakfast:						
Eggs (2)	100	13.2	12.0	0	166	
Ham	75	15.2	16.8	0	219	
Butter	15	0.2	12.9	0	120	
Vegetables [3]	100	1.0	0	3.0	16	
Black coffee						521
Dinner:						
Broth	160	3.5	0.3	0	17	
Steak [2]	160	38.2	16.3	0	308	
Vegetables [3]	300	3.0	0	9.0	49	
Cream cheese	30	7.8	10.1	0.7	129	
Butter	20	0.2	17.2	0	160	
Olive oil	15	0	15.0	0	140	
Black coffee						803
Supper:						
Broth	160	3.5	0.3	0	17	
Eggs (2)	100	13.2	12.0	0	166	
Steak [2]	140	33.5	14.3	0	270	
Vegetables [3]	300	3.0	0	9.0	49	
Butter	20	0.2	17.2	0	160	
Tea (plain)						662
		135.7	144.4	21.7		1986

[2] The caloric equivalent of other carbohydrate-free meat or fish should be frequently substituted from the accompanying list to furnish variety in the diet.

[3] Two or three different vegetables should be chosen from the accompanying list, which tabulates the vegetables containing 5% or less of carbohydrates.

Green or Vegetable Days.—Von Noorden suggested the use of vegetable days and they are of service in giving carbohydrate-free and *low* protein days without so much discomfort to the patient. A sample of such a diet is as follows:

THE JOHNS HOPKINS HOSPITAL GREEN DAY DIET.

	Alcohol, gms.	Protein, gms.	Nitrogen, gms.	Fat, gms.	Carbohydrate, gms.	Total Calories.
Breakfast:						
1 egg, boiled or poached		6.6	1.1	6.0		83
Cup of black coffee						
Dinner:						
Spinach, with a hard-boiled egg		6.6	1.1	6.0	Trace	83
Bacon, 15 gms.		1.5	.2	9.8		100
Salad, with 15 gms. of oil		Trace	Trace	15.0	Trace	150
Whisky, 30 c.cm.	12					
Supper:						
1 egg, scrambled, with tomato and a little butter		6.6	1.1	6.0		83
Bacon, 15 gms.		1.5	.2	9.8		100
Cabbage, cauliflower, sauerkraut, string-beans or asparagus.		Trace	Trace	Trace	Trace	15
Whisky, 30 c.cm.	12					83

	Alcohol, gms.	Protein, gms.	Nitrogen, gms.	Fat, gms.	Carbo-hydrate, gms.	Total Calories
Bedtime:						
Cup of beef tea or chicken broth		3.0	.5	Trace		12
Total	24	26.	4.	53.	Trace	792

Sodium bicarbonate, 15 to 30 gms. in the 24 hours.

Oatmeal Diet.—Von Noorden introduced the oatmeal diet and good results were obtained by it, but they were probably all due to the small amount of food taken rather than any specific action of the oatmeal. It forms, however, a valuable addition to the diabetic diet and is much relished by some patients. Oatmeal days are not much used nowadays, but a sample diet is appended.

OATMEAL DAY DIET THE JOHNS HOPKINS HOSPITAL

	Alcohol, gms.	Protein, gms.	Nitrogen, gms.	Fat, gms.	Carbo-hydrate, gms.	Total Calories.
Oatmeal, 250 gms.		40.0	6.4	15.0	170	1000
Butter, 250 gms.		2.5	.4	213.0		1990
Whites of six eggs		25.0	4.0	.4		105
Whisky 90 c.cm. or Brandy 70 c.cm. or Claret 450 c.cm. or Sour White Wine 450 c.cm.	36					276
2 cups of black coffee						
	36	68	11	228	170	3371

Cook the oatmeal thoroughly in water for two hours. The butter and egg whites must be well stirred in when the oatmeal is nearly done. Use salt and pepper as desired. This may be eaten as gruel, mush, or fried mush. It should be divided into 7 equal parts, one part to be taken every two hours. The black coffee, sour white wine, claret, whisky, or brandy may be taken at any time throughout the day.

Woodyatt approaches the dietetic treatment of diabetes from a somewhat different viewpoint. He believes that the greatest danger to the diabetic, particularly the severe diabetic, is in the acid bodies produced in the breaking down of the patient's own tissues. He therefore insists that the patient should be, at all times, on a diet sufficient for maintenance, so that this breaking down may be avoided. His dietetic formula has the following requirements: (1) that the patient shall receive a total caloric value of food sufficient for maintenance; (2) that the protein of this food shall be as much as, and no more than, is required for the patient's normal nitrogen metabolism; (3) that sufficient glucose shall be available from the diet to completely burn, without the occurrence of ketone bodies, all the fatty acids available from the diet; (4) that the carbohydrate of the diet shall be as low, and the fat as high, as is consistent with the third requirement. He allows as his margin of safety a proportion of 1

gm. of available glucose to $1\frac{1}{2}$ gm. of available fatty acid. Data on which these requirements are based and the mathematics of the Woodyatt formula will be discussed below; for the moment attention is to be directed to this type of diet, frequently called an antiketogenic maintenance diet. Woodyatt's is not the only antiketogenic diet at present in use. The diet of Newburgh and Marsh, with a much greater proportion of available glucose, is also successfully used in many cases. The great importance of the Woodyatt diet is in promptly arresting acidosis; the great significance of Woodyatt's contribution consists in calling attention to the body tissues as a source of food, to be taken into account in the dietetic consideration of diabetes.

Of course, it will be obvious that with a diet in which the proportions and quantities of protein, fat, and carbohydrate are definitely fixed, all food must be weighed and measured so that accurate account may be kept of the amounts ingested. This has long been routine in hospital practice; but it is being more and more realized that, for the ambulant patient under the physician's care such quantitative control of diet spells the difference between successful and unsuccessful treatment. To guess at the size of a portion of food is to admit a completely incalculable error in the estimation of the quantities of fat, protein, and carbohydrate that the patient is receiving; such an error may not be significant in the case of a very mild diabetic, but then the very mild diabetic is never the object of great anxiety. A patient who on an available glucose intake of 100 gm. shows no sugar in the urine, maintains a blood-sugar concentration of about 130 mgm. per 100 c.c., and is completely free of symptoms, may, on an available glucose intake of 125 gm. show urinary sugar, a blood-sugar concentration in the neighborhood of 200 mgm. per 100 c.c., be a chronic invalid, show the typical symptoms of the disease and a rapid weight loss, evidence of β-oxidation, and a progressive diminution of pancreatic function. Unfortunately, there is a belief, not only among the laity but even among many physicians, that *what* the patient eats is rather more important than *how much* the patient eats. This is, of course, dangerously untrue. It is the quantity of the three primary food factors that must be controlled. Whether 10 gm. of carbohydrate are given in the form of 2 Uneeda Biscuits, 1 slice of zwieback, 4 ounces oyster stew, 4 ounces cream of corn soup, 1 glass buttermilk, 1 glass skimmed milk, 100 gm. of dandelion greens, 100 gm. blackberries, 100 gm. of plums, 200 gm. of beets, 200 gm. onions, 400 gm. of squash, 400 gm. spinach, or any other equivalent, the effect is the same. Even in the mild case a quantitatively controlled diet is much to be preferred to one qualitatively limited. And it is not difficult to teach the intelligent patient to quantitatively control the diet. In the Out-patient Department of the Johns Hopkins Hospital over 50 per cent. of the 400 diabetics under treatment at the present writing are on quantitatively prescribed diets, and seem to experience no extreme difficulty in following such diets. When a quantitatively controlled

diet is used the physician has at all times access to definite information regarding the patient's food intake. Those slight adjustments of diet, occasionally necessary in all cases of diabetes, can be carried out with but little trouble, the patient's attention is directed to dietetic control, and he soon learns that indiscretions are visited with definite ill results. "Since I understand my case I am getting along so much better." Such remarks are constantly heard from those who had been previously disappointed with the inconstant results obtained from quantitatively limited diet.

The Woodyatt diet is in most instances very satisfactory in practice. The four requirements which this diet fulfils have been given above. The following facts must be borne in mind:

1. One gram of carbohydrate will suffice for the burning of 1⅔ grams of fat.
2. Fifty-eight per cent. of all ingested protein is available as carbohydrate.
3. Ten per cent. of fat, the glycerin portion, is available as carbohydrate.
4. All the carbohydrate ingested as such and all derived from protein and fat must be taken into account.
5. The fatty acids are estimated as 46 per cent. of the protein and 9 per cent. of the fat.

The patient must be given sufficient protein to cover his needs, and this is estimated differently by various authors, ranging from ½ to 1 gram or even more per kilogram of body weight. Two-thirds of a gram of protein per kilo of body weight may be taken as a conservative and safe allowance, which is not safe to go below for any length of time while the diet should probably never exceed 1 gram per kilo.

The carbohydrate tolerance of the patient furnishes a guide to the amount of carbohydrate that may be given. This is determined by estimating the amount of carbohydrate taken by the patient. This is done by adding the total number of grams of carbohydrate taken as such, plus 58 per cent. of the number of grams of protein ingested, plus 10 per cent. of the number of grams of fat ingested, and subtracting the number of grams of sugar passed in the urine.

This computation may be avoided by using the formula or, easier still, the graph of Wilder, by which if the number of grams of protein and the total food calories are known, the amount of carbohydrate and fat may be determined in a moment.

The amount of fat is determined by ascertaining how much the carbohydrate will metabolize. One gram of carbohydrate will burn 1⅔ grams of fat. But assuming the patient's carbohydrate to be 50 grams in a given case, this does not mean that the fat allowance will be 83 grams of fat, as from this must be subtracted the amount of fat or substances acting like fat available from the metabolism of protein, which is 51 per cent. or, roughly, half of the protein, or the graph of Wilder may be used to determine the amount of fat.

The Woodyatt diet rests on the formula of

$$F = 2\ C + \frac{P}{2}$$

As just explained above, the carbohydrate or glucose is estimated by the formula

$$G = C + 0.58 + 0.1\ F$$

The fatty acids are estimated by the formula

$$FA = 0.46\ P + 0.9\ F$$

Assuming that when the ratio $\frac{FA}{G}$ exceeds 1.5 ketonuria develops the maximum amount of fat is shown in the formula

$$\frac{C - 0.58 - 0.1\ F}{0.46\ P - 0.9\ F} = 1.5 = F = 2\ C + 0.54\ P$$

or simply $F = 2\ C + \frac{P}{2}$

The Wilder graph and directions for using it were published in the Journal of the American Association, 78, 1878, June 17, 1922. Wilder uses two formulas in which M represents the total number of calories:

$$C = 0.024\ M - 0.41\ P$$
$$F = 4\ C + 1.4\ P$$

The protein (P.) may be taken as ⅔ gram per kilogram body weight. Another frequently used formula for the determination of the carbohydrate requirement is that of Evans.

$$C = \frac{\text{Number of calories} - 8.9\ P}{22}$$

Wilder's directions are as follows:

Directions for Use of Charts in Planning Food Mixtures.—The age, sex, height, and weight of the patient are determined, and from them the basal calorie requirement for twenty-four hours is estimated by the chart constructed at the suggestion of Dr. R. M. Wilder, of the Mayo Clinic, enabling one to make a rapid calculation of the basal metabolism. The weight is marked on the weight scale and the height on the height scale with pins (needles set in wooden handles). A straight line connecting these two points crosses the surface area scale at the patient's surface area. The normal standard is located on the left-hand scale. The line connecting this point with the surface area crosses the calorie scale at the basal calorie requirement.

If the patient is confined to his bed or room, the basal requirement represents the total food calorie allowance. If work is permitted, an extra allowance of from 20 to 30 per cent. of the basal requirements is

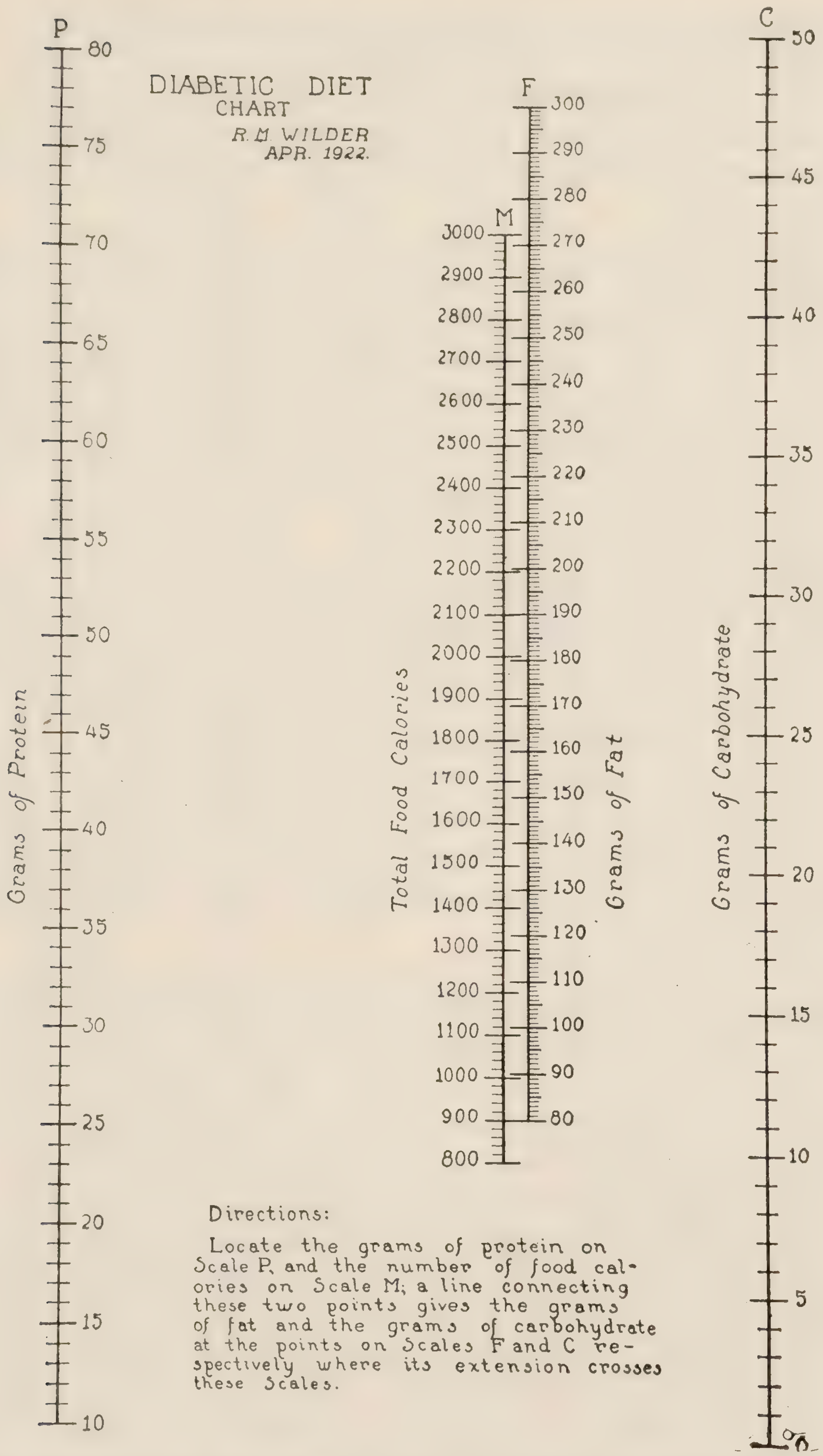


Fig. 6.—Diabetic diet chart: The grams of protein are located on Scale P, and the number of food calories on Scale M; a line connecting these two points gives the grams of fat and the grams of carbohydrate at the points on Scales F and C, respectively, where its extension crosses these scales. (Journal American Medical Association, June 17, 1922.)

made. The sum of the basal requirement and the extra allowance gives the total food calories.

The protein quota of the diet is determined from the weight; for

adults this may be ⅔ or 1 gm. for each kilogram of weight; for children, 1 gm. or more for each kilogram.

The total food calories and the protein allowance are located on the chart in Fig. 6 (Scales C and P). The line connecting these two points and extended crosses Scales F and C at the fat and carbohydrate allowances.

Example.—A man, aged thirty, 5 feet, 10 inches in height, and weighing 140 pounds (63.5 kg.), has a surface area of 1.79 square meters and a total basal calorie exchange of 1670 calories. If he is confined to his room, this represents his total food calorie allowance (Fig. 7). The protein of his diet is 42.4 gm. (⅔ × 63.5 kg.). On Fig. 6 the line connecting 1670 on Scale M and 42.4 on Scale P extended, crosses Scale F at 150.2 and Scale C at 22.7. The food mixture consists, therefore, of 42.4 gm. of protein, 22.7 gm. of carbohydrate, and 150.2 gm. of fat.

Method of Using Boothby and Sandiford's Chart for Basal Metabolism Determination.—The chart shown is for the calculation of the basal calories for twenty-four hours in order to determine readily the amount of food requisite for various individuals. It was constructed by Boothby and Sandiford (Boston Medical and Surgical Journal, 185, 337, September 22, 1921). In determining the quantity of food required by an individual it is more accurate to base the number of food calories on the four factors of age, sex, height, and weight, according to Du Bois' standards, than on weight alone, as has been the general custom.

The normal basal calories per day for an individual is, however, the minimum requirement, and to this must be added an assumed amount to allow for the individual's muscular activity and for the specific dynamic action of the food. This allowance, necessarily, remains arbitrary and will vary mainly with the amount of muscular activity of the individual which, for a hospitalized patient, is not far from 20 to 30 per cent. of the basal requirements.

To use this chart place the needle on the appropriate weight (53.1 kg.), bring the left end of the ruler over the appropriate height (155 cm.), and place the needle on the point where the ruler crosses the surface area scale (1.50 sq. m.); if this is already known, the determination may start from this point; with the needle as pivot, swing the rule to the individual's normal standard if his basal metabolic rate is within normal limits or to the calories per square meter per hour, if determined experimentally (58.4 cal. per sq. meter per hour) and read the answer on the scale for total calories per day (2100 cal.). The minimum requirement, then, for the individual is 2100 calories a day; to this add 20 or 30 per cent. to allow for muscular exertion and the specific dynamic action of the food ingested, making a total calorific requirement between 2500 and 2700 calories per day, depending on the activities of the patient. The addition of 20 or 30 per cent.

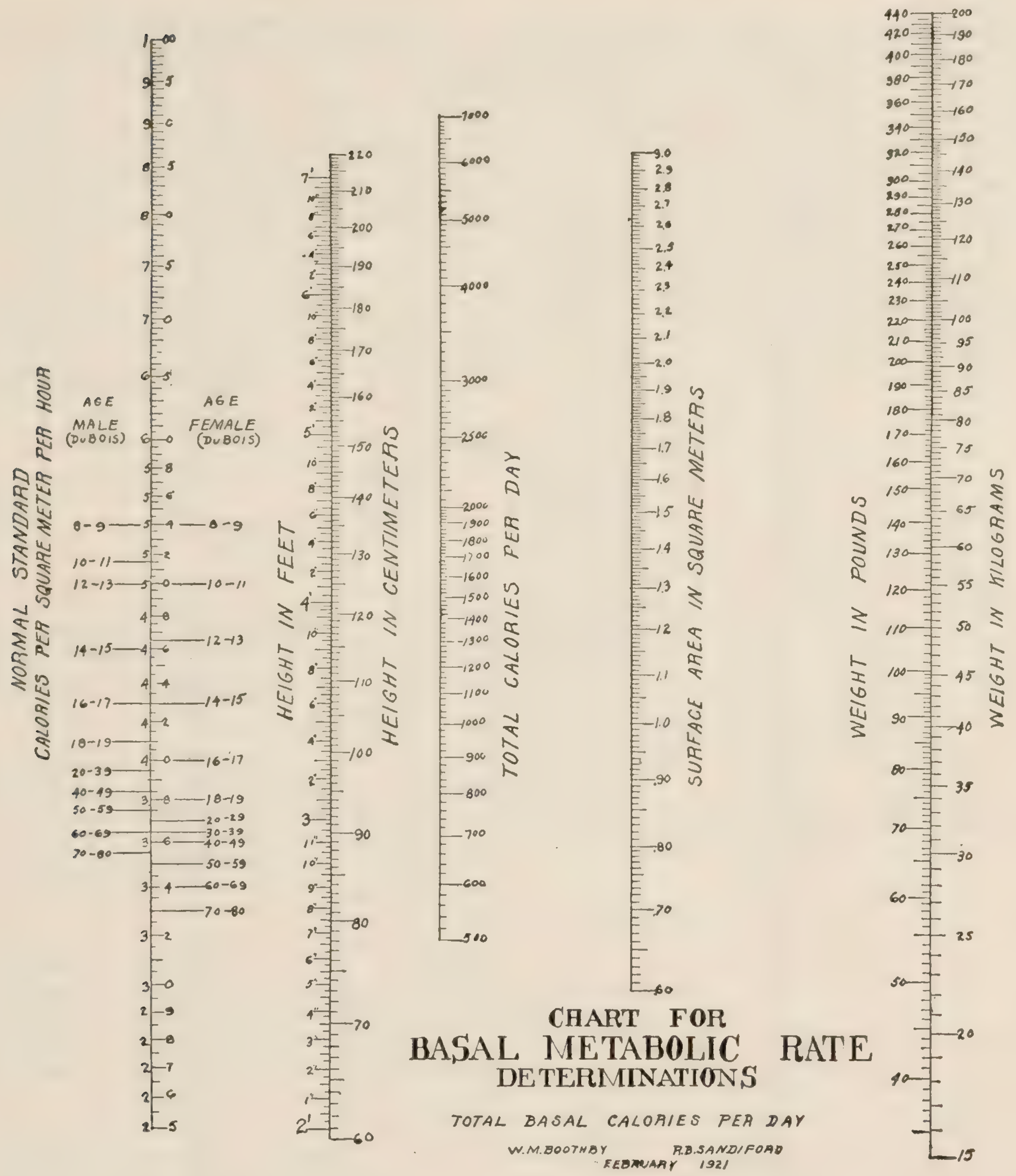


Fig. 7.—Boothby and Sandiford's chart for quick and accurate calculation of normal basal food calorie requirement. The weight is located on the weight scale and the height on the height scale with pins (needles set in wooden handles). A straight edge connecting these two points crosses the surface area scale at the patient's surface area. The normal standard is located on the left hand scale. The line connecting this point with the surface area crosses the calorie scale at the basal twenty-four hour calorie requirement. (Boston Medical and Surgical Journal, September 22, 1921.)

can be done rapidly by writing down the basal calories and placing underneath the product obtained by mental multiplication by 0.2 or 0.3 and adding as follows:

2100		2100
420	or	630
2520		2730.

When it has been determined what amount of protein, fat, and carbohydrate the patient is to receive, the next step is to so select foods that the desired quantities will be given. The tables given at

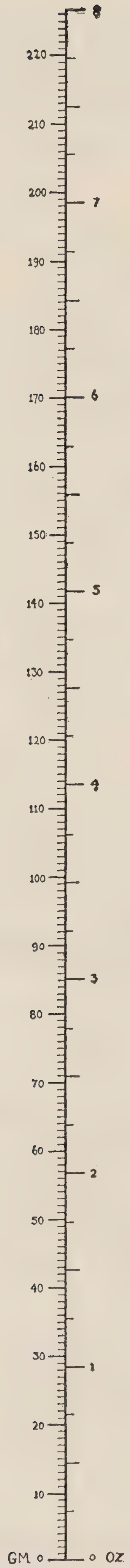


Fig. 8.—Weight measure scale to convert grams to fluid ounces or *vice versa.* (M. Gichner, Del.)

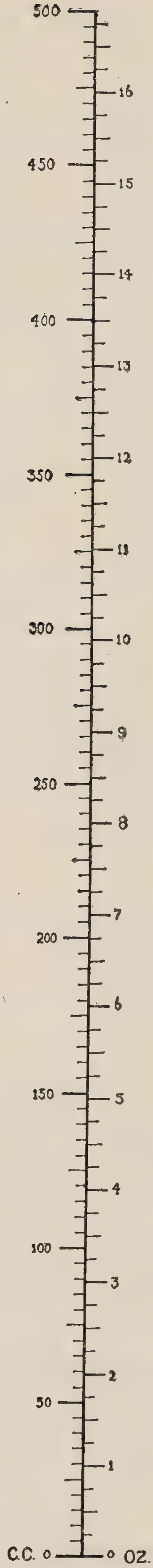


Fig. 9.—Fluid measure scale to convert centimeters to ounces or *vice versa.* (M. Gichner, Del.)

the end of this book provide the necessary data as to the composition of food-stuffs. The patient's tastes may be consulted in prescribing the diet; a patient is more likely to willingly follow a diet in which favorite foods are permitted. It should not be necessary to again state that such a diet as this must always be weighed and measured. These weights and measures may be either in the metric system or in ounces, or even in cups, tablespoons, etc. Tables for the conversion of one of these systems into another will be found in Figs. 8 and 9. A sample diet is printed as an illustration of the form in which instructions as to diet may be given the patient.

Sample Diet

Protein,	50 grams
Fat,	119 grams
Ch,	47 grams

Diet for the Day

300 grams—2 to 3 cupfuls of 5 per cent. vegetables,
75 grams—½ cupful of 10 per cent. vegetables,
75 grams—5 tablespoons of 10 per cent. cream.

2 Uneeda Biscuits or 20 grams white bread

2 eggs,
30 grams—3 to 5 small slices of cooked bacon,
15 grams—1 tablespoon of fat of bacon, chicken, or meat, olive oil, oleomargarine, or mayonnaise,
51 grams—3¾ tablespoons of butter.

Any One Portion o, Fruit

120 grams—grape-fruit edible portion,
15 grams—½ small, 4 inches in diameter, grape-fruit,
90 grams—1 small, 2¾ inches in diameter—apple,
90 grams—orange, edible portion,
80 grams—5 tablespoons orange juice.

Any One Portion of Cereal

15 grams—⅝ cup cornflakes,
15 grams—⅔ cup puffed rice,
15 grams—¾ cup puffed wheat,
15 grams—½ shredded wheat biscuit,
15 grams—¼ cup oatmeal (measured before cooking),
15 grams—1½ tablespoons farina (measured before cooking),
88 grams or slice 2½ x 3 x 1 inch cooked meat lean without bones, beef, chicken, lamb, mutton, pork, turkey, or veal.
or
120 grams or slice 4 x 4 x ½ inch lean boiled ham,
or
120 grams—¼ cup cooked fish.

The 5 per cent. vegetables are: Asparagus, beet greens, Brussels sprouts, cabbage, celery, cauliflower, chard, cucumber, egg-plant, endive, green pepper, kale, kohlrabi, leeks, lettuce, parsley, radishes, rhubarb, sauerkraut, spinach, string beans, tomatoes, and water-cress.

The 10 per cent. vegetables are: Beets, carrots, okra, mushrooms, onions, pumpkins, squash and turnips.

When a patient is receiving such a diet as this certain definite changes may be expected in the clinical picture. In the first place, there is a rapid increase of the blood carbohydrate combining power,

with the disappearance of symptoms of acidosis. β-oxidation products disappear from the urine. The urine either becomes sugar free or else a point is rapidly reached at which the number of grams of sugar excreted for each twenty-four hours becomes approximately constant. It is now possible to arrive at a close approximation of the patient's carbohydrate tolerance. We know how much glucose is available in the diet as given, we subtract from the quantity of glucose given the quantity of sugar excreted, and so discover the quantity that has been utilized. The diet must now be adjusted so that the available glucose is within the patient's tolerance. This is to be done; but not by arbitrarily withdrawing carbohydrate from the diet, since this would raise the fatty acid to glucose ratio with a possible appearance of β-oxidation. A new diet is calculated with a less number of calories per kilogram, and with a resulting lower carbohydrate. Under this treatment a great majority of diabetics are rendered sugar free. In cases in which obesity appears it is well to calculate a diet on the desired weight of the patient, rather than on his actual weight. This will be slightly under the maintenance requirement of such a patient, and a slow but progressive weight loss will occur, automatically terminating as the patient approaches the desired weight. At this point if the patient's tolerance is considerably in excess of the amount of glucose available from the diet, more carbohydrate may be given, but the total caloric value of the diet must be kept constant by the withdrawal of an appropriate amount of fat. This scheme of treatment may be clearer if a typical case is cited, and the detail of diet given.

Case History.—Mrs. B. F., aged thirty-six years, was referred to us with the history that sugar had been found fourteen months previously, and that since the discovery of glycosuria she had been on a diet omitting sugar, potatoes, and dried peas and beans, and substituting gluten bread for bread-stuffs. When first seen she complained of easy fatiguability, severe cramps in the arms and legs, polyuria, constant and extreme hunger and thirst, dizziness, and occasional itching. Since the onset of the disease, eighteen months before, she had lost 27 pounds, and now weighed 176 pounds, with a height of 5 feet, 3½ inches. She gave the history of her mother having died with "sugar disease"; there was no other family history of diabetes. She was referred to us because of the persistence of glycosuria in spite of diet, and the presence in the urine for the last two months of increasing quantities of acetone and diacetic acid. On calculating the diet she had been taking it was discovered to consist of protein 37 gm., fat 85 gm., carbohydrate 189 gm. This large amount of carbohydrate was obtained from vegetables, at least 80 gm. of it from the gluten bread, and the remainder from fruit, which she ate in inordinate quantities. When first seen the patient presented the picture of an obese woman somewhat pale, but otherwise apparently in good health. It was noted that she seemed a trifle drowsy and her answers to questions, though intelligent, were slowed. A twenty-four-hour specimen

of urine showed the presence of 90 gm. of sugar; carbon dioxid combining power was 38.5 vol. per cent.

The patient was sent into hospital and placed on a diet calculated on the Woodyatt formula to supply 30 calories per kilogram of a desired weight of 160 pounds. This diet consisted of protein 77 gm., fat 182 gm., and carbohydrate 72 gm. In the following five days the excretion of sugar dropped to between 8 and 10 gm. per twenty-four hours. Diacetic acid was absent from the urine on the second day; on the fifth day only a trace of acetone could be discovered. The blood-plasma carbon dioxid combining power was now 52 vol. per cent. The patient looked and felt much brighter. A diet was now given allowing 26 calories per kilogram and the patient promptly became sugar free.

She was discharged from the hospital at the end of the third week on a diet of protein 77 gm., fat 158 gm., and carbohydrate 60 gm. While in hospital she had learned to manage her own diet and to examine her own urine. For the past year the patient has held a body weight of about 160 pounds and has only shown sugar on one occasion, following a stay at a summer resort. Since the patient is sugar free she has been without symptoms.

It is interesting in reviewing the history of the dietetic treatment of diabetes to note that those diets which have been successfully employed are, without exception, diets wherein the fatty acid to glucose ratio was less than two, and in which the patient was given a diet sufficient for maintenance; thus the potato cure of Mossé, the yolk cure of Stein, the rye bread cure, etc., von Noorden's oatmeal diet with a protein of 58 gm., a carbohydrate of 170 gm., and a fat of 228 gm., often worked a surprising improvement in patients who had been the subject of long-continued undernutrition. The diet of Newburgh and Marsh calls for a higher fatty acid to glucose ratio than is generally considered safe, but there is much experimental evidence to show that in many cases ketogenesis does not begin until the fatty acid to glucose ratio is in the neighborhood of 3.5. It must be in this group of cases that Newburgh and Marsh report their really surprising results.

Kahn and McKee have recently made edible fat which they call intarvin, which differs from the ordinary fats in that it contains an uneven number of carbon atoms and so is not susceptible of β-oxidation. This may be proved to be of value in diabetes in increasing the patient's caloric intake without exceeding his glucose tolerance or running the risk of setting up an acidosis through the production of excessive fatty acids.

A certain number of diabetics, the most severe cases, have a carbohydrate tolerance so low that it is impossible to plan a diet within the patient's tolerance and at the same time allow sufficient available glucose to prevent the formation of fatty acids. These are the cases occurring in relatively young individuals and in children in which

formerly the prognosis was bad; the physician in spite of his best efforts saw a steady loss and stood by helpless while one after another of the symptoms of acidosis developed, and the patient finally died, sometimes with an intercurrent infection, but more frequently in diabetic coma. In 1921, Banting and Best made an extract of fetal pancreas which markedly reduced the blood-sugar and rendered sugar free the urine of a dog with experimental diabetes. This substance they named insulin. It has been standardized and is marketed for clinical use. Its action is to lessen promptly and rapidly the blood-sugar concentration by increasing the utilization of sugar in the normal metabolism. Such a depression of the blood-sugar is not without marked dangers. If the blood-sugar is depressed below physiologic limits, typical reaction similar to that observed in dehepatized dogs is exhibited. When the blood-sugar concentration drops below 0.08 or 0.07 per cent. the patient suffers with sensations of hunger, tremor, a characteristic nervousness or weakness; pallor, flushing of the face, dilated pupils, and increased pulse-rate, are observed, vertigo and faintness follow, aphasia, delirium, and convulsions alternate with coma. Fortunately we can promptly terminate such a reaction by the administration of glucose, or food in which glucose is readily available. Many patients on insulin treatment carry with them a few lumps of sugar so as to be armed against an impending hypoglycemic reaction.

An impression has unfortunately sprung up in a large measure from newspaper articles on the insulin treatment of diabetes that this remedy makes it possible for the patient to dispense with a rigidly controlled diet. Nothing could be further from the truth. It is in cases treated with insulin that the fact that the dietetic treatment of diabetes mellitus is a *quantitive* problem is most strikingly demonstrated. The patient's glucose tolerance plus a definite dosage of insulin permits the ingestion of a definite amount of carbohydrate without the blood-sugar concentration exceeding desired limits, or the appearance of sugar in the urine. Any tampering with these proportions, when they have been determined for a given case, is promptly followed by ill results.

Although the use of insulin permits a greater variety in the proportion of protein, fat, and carbohydrate to be given, the best practice seems to call for a diet essentially of the type advocated by Woodyatt; the patient's carbohydrate tolerance is raised by the administration of insulin to the point that such a diet can be taken without the occurrence of hypoglycemia. The advantages of this should be obvious. Insulin is a dangerous drug, a two-edged sword; this scheme permits of the smallest possible dosage. Insulin must be given by hypodermic injection; the smaller the volume of each injection, the less discomfort for the patient. Insulin is an expensive material, and in many cases this is no negligible factor.

Hospital Use of Insulin.—An excellent scheme to be followed in

placing a patient on insulin treatment calls for hospital care. The patient is placed in bed and a maintenance diet of antiketogenic type given. There is, of course, a prompt disappearance of symptoms of acidosis, daily determinations of the sugar output are made. A point is soon reached where the number of grams excreted daily is constant, insulin is now given in increasing doses, starting with two units a short time before each meal, and urinalysis is performed three times a day to determine the presence of sugar. When sugar disappears from the urine a blood-sugar determination is made; if the sugar concentration is less than 140 mgm. per 100 c.c. the insulin dosage is reduced by several units. A period now follows in which the dosage of insulin is so adjusted that the patient remains sugar free on the desired diet. While in the hospital the patient or some member of the patient's family is taught how to prepare and measure the diet, how to test the urine for sugar and for acid bodies, and how to administer insulin, and is warned concerning hypoglycemic reactions and instructed to meet them by taking sugar. On discharge the patient can carry on his own treatment supervised by the physician at regular consultations. Following this scheme most of the dangers of insulin therapy are avoided.

The possession of insulin makes it possible for us to successfully meet certain situations in which we were formerly helpless. The glucose tolerance varies with the patient's general state of health. It is markedly diminished by acute infections, by surgical operations or other surgical trauma, by the exertions of labor, or by excessive fatigue. The diabetic at the end of a carbohydrate debauch has a tolerance markedly less than that of the same patient when there has been a period of careful dietetic limitation. In all of these situations insulin may be used to control the diabetes, and gradually withdraw as the tolerance increased. The authors have seen a very interesting series of pneumonias in which during the acute stage and in convalescence the patients were kept sugar free by the use of insulin, and the insulin gradually withdrawn after recovery. It is an excellent practice to adjust a diabetic who must undergo surgical operation to insulin, continuing the treatment through convalescence, with a return to the former diet when the wound is healed. It is, of course, necessary to exercise the greatest care in discontinuing insulin treatment. Sufficient experience has not yet been accumulated for one to speak with authority on the rôle of insulin in obstetrical management of a diabetic, but it seems probable that the same scheme followed for surgical patients would be successful here. We are learning that, following excessive indulgence in carbohydrates, the patient who will have a tolerance sufficiently high not to need insulin does about as well on a simple antiketogenic diet.

The Home Use of Insulin.—A large number of patients must be treated at home, and many physicians are not in reach of a hospital. These cases will have to depend largely on urine examinations, and

in the absence of specially trained assistants who can do blood-sugar determinations and intravenous injections of glucose it is better to proceed very gradually with the use of insulin so as to avoid producing hypoglycemia. If the patient can be made sugar free without the use of insulin, but the diet cannot be increased to cover the minimum requirements without sugar appearing in the urine, then insulin may be given. Each unit of insulin enables the patient to metabolize about 2 grams of carbohydrate, but there are variations in different patients.

Inasmuch as even very small doses of insulin occasionally may produce untoward symptoms it is best to begin treatment with one unit and increase one unit each does until five units are given at one time, and then increase or decrease the dose according to the glycosuria or the calories required. Changes may be made daily until the patient is taking a sufficient amount of food to cover his requirements as established by the Boothby and Sandiford graph plus what is needed with reference to his activity; usually a third more is required if the patient is at moderate work. After a week or two a decrease should be made in the insulin, and if the urine remains sugar free a small amount of carbohydrate is added to the diet without increasing the insulin. After several weeks it is well to omit one-quarter or even one-half the insulin and then build up again as often as the patient's tolerance is increased, and it is found that he can do with smaller amounts.

Insulin is injected subcutaneously, with the strictest aseptic technic, from fifteen to thirty minutes before taking food according to the degree of the individual's power of absorption. Typewritten directions giving all details should be given the patient, and he or whoever has charge should be trained until they understand them thoroughly. The supply of insulin should be arranged for sufficiently long in advance so that the patient will not be without it.

If a reaction occurs, the patient should eat an orange, take a lump or two of sugar, or eat the carbohydrate portion of the next meal.

Insulin should be discontinued gradually, and the patient should be made to understand that the diet must be cut down simultaneously with the decrease in the dosage.

Diabetic Coma.—The patient is in coma because the blood carbon dioxid combining power is lowered far beyond normal limits. It would seem that the administration of alkalies would be indicated. Nothing could be farther from the truth. If ketogenesis can be stopped, and the blood sugar lowered, the carbon dioxid combining power promptly rises.

In hospital practice the patient should receive large doses of insulin and the blood-sugar concentration should be determined before each dose. Sugar in the form of glucose may be given intravenously. The circulation must be supported. If there is vomiting, the stomach may be washed out. Since desiccation usually accompanies coma, water should be administered by all the usual routes. It is not unusual to

give a patient as much as 50 units of insulin intravenously at the beginning of treatment in deep coma, and twenty-four hours later to have the patient awake and receiving only 20 units of insulin subcutaneously for the next twenty-four hours. But it is better to prevent coma than to treat it, and the prompt beginning of insulin therapy in threatened coma will stave off untoward results.

Diabetic Coma Apart from Hospital Practice.—Smaller doses of insulin should be used. A small dose, 10 units, used early is, of course, much better than larger doses later on. Joslin suggests giving 10 to 20 units, preferably intravenously, as soon as the diagnosis is made. If the patient does not show improvement in one hour this should be repeated until four such doses shall have been given, after which 5 to 10 units should be given every two to four hours for the remainder of twelve hours. If more than 80 units are needed the patient will probably die.

Diabetes in children presents essentially the same problem as diabetes in adults. The diet must be limited to within the patient's tolerance; a sufficient diet must be given for maintenance, but here the needs of growth must also be taken into account. Since diabetes in children is usually severe and since tolerance does not seem to increase with the increase of body weight through growth, these patients usually require insulin. Their adjustment to insulin therapy should be exactly the same as in the case of an adult, their diet should be of antiketogenic type with the lowest consistent available glucose. But since a child must grow, the protein allowance must be larger, varying from $1\frac{1}{2}$ to $2\frac{1}{2}$ gm. per kilogram of the patient's body weight. Since extreme self-control is not a characteristic of children, great vigilance must be exercised to prevent dangerous breaks in diet. However, the physician is often agreeably surprised to find unexpected co-operation and intelligence in his juvenile cases.

Alcohol.—Formerly alcohol was much used in the treatment of diabetes mellitus because of its high caloric value, and the fact that it did not form ketone bodies. We now avoid the use of alcohol, since the calories obtained from this substance are early utilized, with a consequent release of glucose which might otherwise be burned. Except in very limited quantities, as a stomachic and to facilitate the taking of a high fat diet, alcohol has no place in the modern treatment of diabetes.

Bread.—There is no theoretical objection to the use of bread in the treatment of a case of diabetes, since 20 gm. of glucose in the form of bread is no more than 20 gm. of glucose obtained from any other food. But since the slight excess in the amount of bread taken introduces a relatively large excess of glucose intake, and since the diabetic can learn to do without bread, it seems as a purely practical matter better to omit it from the dietary scheme. The same objection holds good for the various bread substitutes which have flooded the market. Even if, as is seldom the case, they are of constant composition, most

of them are hardly appetizing. Protein flours are frequently used, but the same amount of protein given in other forms is a more acceptable food, and the special diabetic foods form expensive and unnecessary substitutes for the more usual articles of diet. For the use of the physician tables of analysis of most of the special diabetic foods present on the market are given on subsequent pages. There is, of course, no objection to the use of saccharin for sweetening, but it is the experience of the authors that most patients relish their food more if an excessive amount of saccharin is not used.

Prophylaxis.—It should be noted that there is a group of patients who while not definitely diabetic are potentially diabetic. This includes those individuals in whom there is a marked familial tendency to diabetes, as well as a definite group of the obese. Such patients should not be left alone to develop a clincially definite diabetes, some restriction of the carbohydrate intake as well as a serious effort to reduce the excessive weight, results often in avoiding strains of the carbohydrate tolerance which would otherwise end in outspoken diabetes.

Joslin has devised a number of charts which are useful in making records for following the progress of a case of diabetes. These may be obtained in pads from Thomas Groom and Company, 105 State Street, Boston. The following is the diet prescription blank for severe cases:

Name .... Date ....

Food	*Breakfast.*	*Dinner.*	*Supper.*	*Total Grams.*	*Carbohydrate.*	*Protein.*	*Fat.*
5% veg.	....	....	....	....	....	....	....
10% veg.	....	....	....	....	....	....	....
Eggs	....	....	....	....	....	....	....
Meat Cooked	....	....	....	....	....	....	....
Chicken	....	....	....	....	....	....	....
Fish	....	....	....	....	....	....	....
Bacon	....	....	....	....	....	....	....
Butter	....	....	....	....	....	....	....
Cream, 20%	....	....	....	....	....	....	....
Cream, 40%	....	....	....	....	....	....	....
Oatmeal	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
				Total Grams	....	....	....
				Multiply for Calories	4	4	9
				Total Calories = ...	....	....	....

DIET LISTS FOLLOWING STARVATION TREATMENT OF DIABETES AS FOLLOWED BY THE AUTHORS.

First day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Asparagus	2 htbsp.	23	Spinach	2 htbsp.	57	String beans	2 htbsp.	13
Cabbage	3 htbsp.	5	Celery	3 stalks	8	Tomato	½ small	23
Tea or coffee			Tea or coffee			Tea or coffee		
							Total	129

Second day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Egg	one	83	Spinach	2 htbsp.	57	Egg	one	83
Lettuce	three leaves	5	Asparagus	2 htbsp.	23	Turnips	2 htbsp.	6
			String beans	2 htbsp.	13	Celery	3 small stalks	8
	Tea			Coffee			Coffee	
							Total	278

Third day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Egg	one	83	Egg	one	83	Egg	one	83
Spinach	2 htbsp.	57	String beans	2 htbsp.	13	Turnips	2 htbsp.	6
Tomato	½ small	23	Asparagus	2 htbsp.	23	Cabbage	3 htbsp.	5
	Coffee			Tea			Coffee	
							Total	376

Fourth day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Egg	one	83	Chicken	small serving	50	Egg	one	83
Asparagus	2 htbsp.	23	Cauliflower	2 htbsp.	8	Asparagus	2 htbsp.	23
	Tea		Spinach	2 htbsp.	57	String beans	2 htbsp.	13
			Tea or coffee				Coffee	
							Total	340

Fifth day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Egg	one	83	Chicken	small serving	50	Egg	one	83
Tomato	½ small	23	Brussels sprouts	2 htbsp.	25	Spinach	2 htbsp.	57
Asparagus	2 htbsp.	23	Celery	3 small stalks	8	Cucumber	8 thin slices	9
	Tea			Coffee			Tea	
							Total	360

Sixth day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Egg	one	83	Steak round	small	85	Egg	one	83
Spinach	2 htbsp.	57	String beans	2 htbsp.	13	Celery	three small stalks	8
	Coffee			Tea		Lettuce	three leaves	5
						Tomato	½ small	23
							Coffee	
							Total	450

Seventh day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Bacon	2 slices 6″ long	323	Chicken	small serving	50	Egg	one	83
Tomato	½ small	23	Turnips	2 htbsp.	6	String beans	2 htbsp.	23
Cream	1 tbsp.	54	Asparagus	2 htbsp.	23	Cream	1 tbsp.	54
	Tea		Butter	1 ball	119		Coffee	
			Cream	1 tbsp.	54			
				Coffee			Total	800

Eighth day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Bacon	2 slices	323	Lamb chop	one small	367	Egg	one	83
Tomato	½ small	23	Cucumbers	8 thin slices	9	Spinach	2 htbsp	57
String beans	2 htbso.	23				Cabbage	3 htbsp.	5

Cream	1 tbsp.	54
Tea		

Lettuce	three leaves	5
Celery	6 small stalks	16
Milk	small glass	80

Celery	6 stalks	16
Coffee	1 cup	
	Total	1040

Ninth day following starvation day.

Breakfast

	amt.	cal.
Egg	one	83
Asparagus	2 htbsp.	23
Butter	1 ball	119
Cream	1 tbsp.	54
Coffee	1 cup	

Dinner

	amt.	cal.
Tend. steak	small	286
Cabbage	3 htbsp.	5
Turnips	2 htbsp.	6
Tea	1 cup	
Cream	1 tbsp.	54

Supper

	amt.	cal.
Bacon	2 slices	323
Cucumbers	8 slices	9
Lettuce	3 leaves	5
Cream	1 tbsp.	54
Coffee	1 cup	
	Total	1015

Tenth day after starvation day.

Breakfast

	amt.	cal.
Bacon	2 slices	323
Spinach	2 htbsp.	57
Cream	1 tbsp.	54
Butter	1 ball	119
Coffee	1 cup	

Dinner

	amt.	cal.
One squab	small	300
Cauliflower	2 htbsp.	8
String beans	2 htbsp.	13
Cream	1 tbsp.	54
Butter	1 ball	119
Tea	1 cup	

Supper

	amt.	cal.
Egg	one	83
Asparagus	2 htbsp.	23
Celery	6 small stalks	16
Coffee	1 cup	
Butter	1 ball	119
Cream	1 tbsp.	54
	Total	1340

Eleventh day after starvation day.

Breakfast

	amt.	cal.
Bacon	2 slices	323
Cauliflower	2 htbsp.	8
Tomato	1 small	46
Coffee	1 cup	
Cream	1 tbsp.	54
Butter	1 ball	119

Dinner

	amt.	cal.
Steak round	small	185
Spinach	2 htbsp.	57
Brussels sprouts	2 htbsp.	25
Cucumbers	8 thin slices	9
Tea	1 cup	
Cream	1 tbsp.	54

Supper

	amt.	cal.
Egg	one	83
Cold chicken	small slice	50
Lettuce	3 leaves	5
Celery	6 small stalks	16
Coffee	1 cup	
Cream	1 tbsp.	54
Butter	1 ball	119
	Total	1215

Twelfth day after starvation day.

Breakfast

	amt.	cal.
Egg	one	83
Tomato	1 small	46
Cream	1 tbsp.	54
Coffee	1 cup	
Butter	1 ball	119

Dinner

	amt.	cal.
Steak tend.	small	286
Carrots	3 htbsp.	18
Asparagus	3 htbsp.	23
Coffee	1 cup	
Cream	1 tbsp.	54
Butter	1 ball	119

Supper

	amt.	cal.
Egg	one	83
Turnips	2 htbsp.	6
String beans	2 htbsp.	13
Coffee	1 cup	
Cream	1 tbsp.	54
Butter	1 ball	119
	Total	1100

Thirteenth day following starvation day.

Breakfast

	amt.	cal.
Bacon	2 slices	323
Tomato	½ small	23
String beans	2 tbsp.	13
Tea	1 cup	
Cream	1 tbsp.	54
Butter	1 ball	119

Dinner

	amt.	cal.
Broth	1 cup	48
Roast chicken	1 slice	90
Cauliflower	2 htbsp.	8
Asparagus	2 htbsp.	23
Milk	small glass	80
Butter	1 ball	119

Supper

	amt.	cal.
Egg	one	83
Spinach	2 htbsp.	57
Cabbage	3 htbsp.	5
Celery	6 small stalks	16
Coffee	1 cup	
Cream	1 tbsp.	54
	Total	1115

Fourteenth day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Egg	one	83	Chicken broth	1 cup	42	Cold ham	one slice	140
Tomato	one small size	46	Squab	one	300	Cabbage	3 htbsp.	5
Coffee	1 cup		Celery	3 small stalks	8	Lettuce	2 or 3 leaves	4
Cream	1 tbsp.	54	Boiled onion	one onion	42	Butter	1 ball	119
Butter	1 ball	119	Tea	1 cup		Tea	1 cup	
			Cream	2 tbsp.	108		Total	1055

Fifteenth day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Egg	one	83	Broth	one cup	48	Egg	two	166
Bacon	2 slices	323	Steak tenderloin	small serving	286	Lettuce	2 leaves	4
Peas	1½ tbsp.	90	Lettuce	2 leaves	4	Bread	1 slice 3 x 3½"	40
Tomato	½ small	23	Cabbage	3 htbsp.	5	Butter	1 ball	119
Cream	1 tbsp.	54	Cream	2 balls	108	Tea	1 cup	
Coffee	1 cup		Coffee	1 cup			Total	1360

Sixteenth day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Bacon	2 slices 6" long	323	Chop, lamb	one small	367	Egg	two	166
Tomato	small	46	Cucumbers	8 thin slices	9	Spinach	2 htbsp.	57
String beans	2 htbsp.	23	Squash	2 htbsp.	69	Cabbage	3 htbsp.	5
Asparagus	2 htbsp.	156	Lettuce	2 leaves	4	Celery	6 small stalks	16
Tea	1 cup		Milk	small glass	80	Coffee	1 cup	156
Butter	1 ball	119					Total	1235

Seventeenth day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Egg	one	83	Vegetable soup	1 cup	18	Cold ham	slice	93
Parsnips	2 htbsp	10	Roast chicken	1 slice	90	Sprouts	2 tbsp	25
Potato	one very small		Cauliflower	2 htbsp	8	Celery	6 stalks	19
Milk	small glass	80	String beans	2 htbsp	13	Tea	1 cup	156
Bacon	2 slices	323	Tea	1 cup	156	Cream	1 tbsp	54
			Cream	2 tbsp	108	Butter	1 ball	119
			Butter	1 ball	119		Total	1200

Eighteenth day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Bacon	2 slices 6" long	323	Chicken	small portion	109	Egg	two	166
Egg	one	83	Cauliflower	2 htbsp	8	String beans	2 htbsp	13
Asparagus	2 htbsp	23	Spinach	2 htbsp	57	Turnips	2 htbsp	6
Butter	1 ball	119	Butter	1 ball	119	Cream	2 tbsp	108
Cream	2 tbsp	108	Cream	1 tbsp	54	Tea	1 cup	
Coffee	1 cup		Tea	1 cup			Total	1319

Nineteenth day following starvation day.

Breakfast	amt.	cal.	*Dinner*	amt.	cal.	*Supper*	amt.	cal.
Bacon	2 slices 6" long	323	Beef broth	1 cup	32	Egg	two	166
Parsnips	2 htbsp	10	Round steak	small	185	Asparagus	2 htbsp	23
Potato	1 htbsp	56	Celery	6 stalks	19	Spinach	2 htbsp	57
			Tomato	1 small	46	Bread	1 slice 3"x3½"	40

Butter	1 ball	119
Cream	2 tbsp	108
Coffee	1 cup	

Cream	1 tbsp	54
Tea	1 cup	

Milk	small glass	80
Tea	1 cup	
Butter	1 ball	119
	Total	1400

Twentieth day following starvation day.

Breakfast

	amt.	cal.
Bacon	2 slices 6″ long	323
Egg	one	83
Orange	1 small	40
Asparagus	2 htbsp	19
Tea	1 cup	
Butter	1 ball	119
Cream	1 tbsp	54

Dinner

	amt.	cal.
Broth		48
Lamb chop	one	367
Cabbage	3 htbsp	5
Tomato	½ small	23
Coffee	1 cup	
Cream	2 tbsp	108
Butter	1 ball	119

Supper

	amt.	cal.
Egg	one	83
String beans	2 htbsp	13
Cabbage	3 htbsp	5
Cucumber	8 thin slices	9
Tea	1 cup	
Cream	1 tbsp	54
Butter	1 ball	119
	Total	1350

Twenty-first day following starvation day.

Breakfast

	amt.	cal.
Egg	one	83
Tomato	1 small	46
Cream	2 tbsp	108
Coffee	1 cup	
Butter	ball	119

Dinner

	amt.	cal.
Squab	one	300
Spinach	2 htbsp	57
String beans	2 htbsp	13
Lettuce	2 leaves	4
Boiled onion	one	42
Cream	1 tbsp	54
Tea	1 cup	
Butter	1 ball	119

Supper

	amt.	cal.
Egg	one	83
Salmon	small serving	100
Asparagus	2 htbsp	23
Celery	6 small stalks	19
Milk	small glass	80
Butter	1 ball	119
	Total	1350

Twenty-second day following starvation day.

Breakfast

	amt.	cal.
Eggs	two	166
Parsnips	2 htbsp	10
Bread	2 by 1½	20
Tea	1 cup	
Cream	1 tbsp	54
Butter	1 ball	119

Dinner

	amt.	cal.
Boiled ham	1 slice	290
Cabbage	3 htbsp	5
String beans	2 htbsp	23
Milk	1 glass	140
Butter	1 ball	119
Spinach	2 htbsp	57

Supper

	amt.	cal.
Egg	one	83
Cold chicken	1 slice	150
Asparagus	2 htbsp	23
Coffee	1 cup	
Cream	1 tbsp	54
Butter	1 ball	119

Twenty-third day following starvation day.

Breakfast

	amt.	cal.
Orange	1 small	40
Bacon	1 slice 6″	161
Egg	one	83
Tomato	½ small	23
Bread	1 slice 3x3½x½	80
Tea	1 cup	
Cream	1 tbsp	54
Butter	1 ball	119

Dinner

	amt.	cal.
Broth	1 cup	48
Steak round.	small portion	185
Cucumber	8 thin slices	9
Cauliflower	2 htbsp	8
Tea	1 cup	
Cream	1 tbsp	54
Butter	1 ball	119

Supper

	amt.	cal.
Eggs	two	166
String beans	2 htbsp	13
Asparagus	2 htbsp	23
Spinach	2 htbsp	57
Coffee	1 cup	
Cream	1 tbsp	54
Butter	1 ball	119
	Total	1400

Twenty-fourth day following starvation day.

Breakfast

	amt.	cal.
Bacon	2 slices 6″ long	323
Asparagus	2 htbsp	19
Spinach	2 htbsp	57

Dinner

	amt.	cal.
Broth	1 cup	48
Chicken	small portion	135
Peas	1½ tbsp	90

Supper

	amt.	cal.
Eggs	two	166
Tomato	1 small	46
Celery		19
Cream	2 tbsp	108

Milk	small glass	80
Butter	1 ball	119

Lettuce	2 leaves	4
Butter	1 ball	119
Cream	1 tbsp	54
Coffee	1 cup	

Tea	1 cup	
Butter	1 ball	119
	Total	1500

Twenty-fifth day following starvation day.

Breakfast

	amt.	cal.
Egg	one	83
Bacon	2 slices	323
Bread	3x3x½	48
Cauliflower	2 htbsp	8
Milk	small glass	80
Butter	1 ball	119

Dinner

	amt.	cal.
Broth	1 cup	48
Tenderloin steak	1 portion	286
Lettuce	2 leaves	4
Boiled onion	1 onion	42
Butter	1 ball	119
Cream	2 tbsp	54
Coffee	1 cup	

Supper

	amt.	cal.
Eggs	two	166
String beans	2 htbsp	13
Tomato	one	46
Tea	1 cup	
Butter	1 ball	119
Cream	1 tbsp	54
	Total	1550

Twenty-sixth day following starvation day.

Breakfast

	amt.	cal.
Egg	one	83
Bacon	2 slices	328
Tomato	½ small	23
Potato	1 htbsp	56
Cream	1 tbsp	54
Butter	1 ball	119
Tea	1 cup	

Dinner

	amt.	cal.
Broth	1 cup	48
Squab	one	300
Spinach	2 htbsp	57
Sprouts	2 htbsp	20
Cucumbers	8 thin slices	9
Tea	1 cup	
Butter	1 ball	119

Supper

	amt.	cal.
Egg	one	83
String beans	2 htbsp	13
Asparagus	2 htbsp	23
Cauliflower	2 htbsp	8
Coffee	1 cup	
Cream	1 tbsp	54
Butter	1 ball	119
	Total	1500

Twenty-seventh day following starvation day.

Breakfast

	amt.	cal.
Orange	1 small	40
Egg	one	83
Asparagus	2 htbsp	23
Tea	1 cup	
Cream	1 tbsp	54
Butter	1 ball	119

Dinner

	amt.	cal.
Boiled ham	1 slice	290
Cabbage	3 htbsp	5
Tomato	1 small	46
Coffee	1 cup	
Cream	2 tbsp	108
Butter	1 ball	119

Supper

	amt.	cal.
Bacon	2 slices	323
Parsnips	2 htbsp	10
Milk	small glass	80
Butter	1 ball	119
Spinach	2 htbsp	57
	Total	1560

Twenty-eighth day following starvation day.

Breakfast

	amt.	cal.
Egg	one	83
Tomato	½ small	23
Bread	3x3x½	48
Coffee	1 cup	
Cream	2 tbsp	108
Butter	1 ball	119

Dinner

	amt.	cal.
Steak Tenderloin	small portion	256
Peas	1½ tbsp	90
Lettuce	2 leaves	4
Milk	small glass	80
Butter	1 ball	119

Supper

	amt.	cal.
Egg	one	83
Salmon	small serving	100
Asparagus	2 htbsp	23
String beans	2 htbsp	13
Tea	1 cup	
Cream	2 tbsp	108
Butter	1 ball	119
	Total	1400

SUBSTITUTES FOR SUGAR

Various substances are used in place of sugar to sweeten the food and drink of the diabetic. Many of these are sold under trade names, as "*Crystallose*" and "*Diabetin*." Preparations of *inulin*, of *inosite*, of *mannite*, and of *fruit-sugar* have also been suggested as being less injurious than cane-sugar.

Glycerin is unsuitable.

Saccharin (benzoyl-sulphonic-imid) is used largely; it has an exceedingly sweet taste, and may be procured in tablets that are equal in sweetening power to an ordinary lump of sugar. If taken in quan-

tities not exceeding five grains a day, it is harmless. The following is a much-quoted formula given by James Stewart:

Sodium bicarbonate	gr. xxx.
Saccharin	gr. xl.
Mannite	℥xijss.

Make 100 pastilles. One will sweeten a cup of coffee.

Garantose (sodium benzoyl-sulphonic-imid—Heyden) is a much more soluble preparation than saccharin.

Dulcin (paraphenatolcarbamid—Heyden) is in common use in Germany for sweetening the food and drink of diabetics, and is recommended by many of the highest authorities. In the small quantities in which it is prescribed it is harmless, but in the large quantities that have been given experimentally it gives rise to such symptoms as icterus, etc. More than half a gram (8 grains) should not be given in any one day. It may be procured in tablets containing 0.025 gram each. Each of these has the sweetening power of an ordinary lump of sugar. Some patients prefer the taste of dulcin to that of saccharin, and vice versa.

Saxin is a coal-tar product used to sweeten the food of the diabetic, and is said to be six hundred times sweeter than sugar; many patients prefer its taste to that of the other preparations. It may be obtained in tablet form.

Sugar-free marmalades, jellies, and jam are manufactured by Callard and Co. They also prepare preserved fruits for diabetics. These fruits are said to contain less than 2 per cent. of sugar.

SUBSTITUTES FOR BREAD [1]

"Torrified" Bread.—Thin slices of bread are toasted until very dark brown or almost black. It is supposed that the starch and gluten are partially decomposed by the heat. This will almost certainly not be eaten to excess by the patient, and Williamson states that this is probably its only advantage.

Gluten bread, introduced over fifty years ago by Bouchardat, has always been popular in France. This bread is made from gluten flour from which the starch has been washed out. The gluten flours on the market differ very much in the amount of starch which they contain, a fact that can be illustrated by testing with an iodin solution.

Directions for making gluten bread accompany the packages of flour.

Bran bread, made from bran flour, is also to be recommended. The bran must be ground quite fine, or it will not be digested.

Almond cakes and *cocoanut cakes* are of considerable value as bread substitutes. König gives the following analysis of sweet almonds:

[1] Recipes for these will be found in the Appendix.

Water	5.39	Carbohydrate	7.23
Protein	24.18	Cellulose	6.56
Fat	53.68	Ash	2.96

Aleuronat is a vegetable albumin flour made by Dr. Hundhausen from wheat. It is a light-yellowish powder, and contains from 80 to 90 per cent. of albumin and only 7 per cent. of carbohydrate. It was recommended in diabetes by Ebstein, who suggests that it be mixed with wheat flour. His formula contains considerable starch,—*i. e.*, about one-half the amount of ordinary bread; and most patients prefer to have half the quantity of wheat bread to a double allowance of aleuronat bread.

Buns and *cakes* may also be made with the aleuronat flour, and they are very palatable if made with the addition of cocoanut powder, as suggested by Williamson. Recipes will be found in the section devoted to that subject.

Inulin biscuits have been suggested by Külz and others. Their expense is a great objection to their use. Inulin is obtained from the roots of elecampane.

Peanut flour has also been used with success in making various dishes for the diabetic.

A large number of diabetic flours, breads, biscuit, and other sugar and starch-free foods are prepared by Callard and Co. of London.

Diabetic Foods.—Numerous diabetic foods are on the market, some of which contain small quantities of starch, but many of which contain large quantities, that are sold with statements which are not always strictly true.

Many of the so-called diabetic flours are made from wheat flour by washing out part of the starch and then drying. Various other cereals and the seeds of various legumes are also used. Almonds and some other nuts, and also casein prepared from skimmed milk are frequently used. Care should be taken to obtain fresh products, as many of the foods are packed in pasteboard boxes, may be infected with moulds or insects, and also change somewhat in their composition, due to the evaporation or absorption of water.

The following table is from the Report of the Connecticut Agriculture Station Part 1, 1913. We are indebted to the Director for permission to reprint this valuable contribution. The percentages of protein were obtained by using the factor 6.25 but it should be borne in mind that for gluten and wheat flours 5.7 gives nearer the exact figures. In the products with a very high protein content this makes some little difference. A blank space means that the carbohydrate was not determined while 0 stands for its absence.

TABLE I.—ANALYSES

Date of Analysis. (See page 14.)		Manufacturer and Brand.
		FLOURS AND MEALS
1910	43	Acme Mills Co., Portland, Ore., Acme Diabetic Flour
....	30	Amthor & Co., Halle, Weizen-Protein
1906	8	Herman Barker, Somerville, Mass., Barker's Gluten Food "A"
1912	16	" " " " " " "
1906	8	" " " " " " "B"
1913		" " " " " " "
1906	8	" " " " " " "C"
1913		" " " " " " "
1907	10	Bischof & Co., London, Gluten Flour
1906	8	Callard, Stewart & Watt, London, Casoid Flour
1909	19	" " " " " "
1912	16	Cereo Co., Tappan, N. Y., Soy Bean Gruel Flour
1913		" " " " " " "
1906	8	Farwell & Rhines, Watertown, N. Y., Cresco Flour
1913		" " " " " "
1913		" " " " " "
1904	7	" " " " Gluten Flour
1906	8	" " " " " "
1906	8	" " " " " "
1909	19	" " " " " "
1913		" " " " " "
1913		" " " " " "
1904	7	Farwell & Rhines, Watertown, N. Y., Special Diabetic Food
1906	8	" " " " " " "
1906	8	" " " " " " "
1906	8	" " " " " " "
1913		" " " " Special Dietetic Food
1910	34	Gericke, Potsdam, Aleuronat
1913		Golden Rod Milling Co., Portland Ore., Acme Special Flour
1913		O. B. Gilman, Boston, Mass., Gluten Flour
1909	19	Karl Goldscheider, Carlsbad, Conalbin-Mehl No. 1
1910	34	Gumpert, Berlin, Ultramehl
1908	37	Hazard's Wheat Protein
1906	8	Health Food Co., New York, Almond Meal
1913		" " " " "
1911	14	" " " C B X Cold Blast Flour, 25% Protein
1906	8	" " " Glutosac Gluten Flour

OF DIABETIC FOODS.

No. of Pieces.	Net weight of package.	Cost per package.	Cost per pound.	Water.	Ash.	Protein (Nx6.25). (See page 15.)	Fiber.	Nitrogen-free Extract. (See page 15.)	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
	gms.	cts.	cts.	%	%	%	%	%	%	%	gms.	
..	....	...	...	9.4	1.1	9.4	0.8	77.4	1.9	71.4	7	364
..	....	...	...	8.6	1.1	84.1	..	4.8	1.4	....	110	368
..	....	...	...	10.1	0.2	85.4	0.0	3.7	0.6	*4.5	143	362
..	363	125	156	7.4	0.4	86.9	0.2	4.6	0.5	Trace	115	370
..	....	...	...	10.1	0.2	84.4	0.0	4.7	0.6	*6.0	113	362
..	381	100	119	6.3	0.4	85.1	0.4	7.2	0.6	3.7	74	375
..	....	...	...	9.7	0.2	82.5	0.0	6.8	0 8	*8.3	78	364
..	385	100	118	5.7	0.4	84.1	0.6	8.6	0.6	3 4	62	377
..	....	...	...	10.1	1.3	79.8	0.2	5.0	3.6	....	106	372
..	907	150	75	10.0	2.5	85.6	1.4		0.5	0.0	377+	353
..	907	150	75	10.3	2.5	82.5	3.1		1.6	....	171+	357
..	352	50	65	4.9	4.4	45.7	1.9	22.6	20.5	0.6	23	458
..	467	50	49	4.2	4.2	43.1	2.2	24.9	21.4	Trace	21	465
..	....	...	...	12.7	0.5	11.1	0.0	74.8	0.9	....	7	352
..	454	9	9	12.7	0.4	18.1	0.4	67.4	1.0	57.2	8	351
..	2321	50	...	...	..	20.1	..	...	...	....	?	...
..	....	...	...	...	..	9.4	..	...	...	much	?	...
..	....	...	...	12.7	0.4	11.4	0.3	74.3	0.9	*71.5	7	351
..	....	...	...	13.3	0.5	10.8	0.1	74.3	1.0	72.0	7	349
..	....	...	...	10.7	0.5	12.0	76.3		0.5	....	7+	358
..	2330	115	22	8.3	0.6	43.1	0.2	46.6	1.2	38.1	11	370
..	509	15	13	8.6	0.5	46.3	0.6	42.9	1.1	32.8	12	367
..	....	...	...	...	..	13.5	..	...	...	much	?	...
..	....	...	...	12.0	1.9	14.3	1.4	67.4	3.0	*58.3	8	354
..	....	...	...	10.3	1.6	14.2	1.1	70.0	2.8	*62.1	8	362
..	....	...	...	12.4	1.3	12.8	0.6	70.3	2.6	....	8	358
..	445	10	10	9.6	1.8	27.5	1.7	56.6	2.8	40.0	9	362
..	....	...	...	9.3	0.9	83.4	3.1		3.3	....	171+	376
..	....	...	...	10.0	0.7	15.8	0.7	71.4	1.4	57.9	7	361
..	454	11	11	8.7	1.0	47.3	0.6	40.4	2.0	31.4	13	369
..	....	...	...	9.4	0.5	10.9	78.8		0.4	....	7+	362
..	....	...	...	6.6	2.9	36.5	9.4		44.6	....	56+	585
..	....	...	...	7.0	0.6	41.8	0.3	49.1	1.2	....	11	374
..	....	...	...	8.5	6.4	50.6	2.9	16.0	15.6	*7 2	33	407
..	469	100	97	7.9	6.3	50.3	2.8	17.9	14.8	Trace	30	406
..	2350	75	15	8.7	0.5	10.1	0.2	79.6	0.9	68.9	7	367
..	....	...	...	10.1	1.1	34.1	1.0	52.1	1.6	*49.3	10	359

* Determined by the diastase method, without previous washing with water, and calculated as starch.

TABLE I.—ANALYSES

Date of Analysis. (See page 14.)		Manufacturer and Bran[d]
		FLOURS AND MEALS. *(cont.)*
1909	19	
1911	35	Health Food Co., New York, Glutosac Gluten Flour
1913		" " " " " "
		" " " " " "
1913		
1906	8	Health Food Co., New York, Pronireu (Gluten Griddle Cake Flour)
1913		" " " Protosac Gluten Flour
1913		" " " " " "
1906	8	" " " Protosoy Soy Flour
1913		" " " Pure Washed Gluten Flour
		" " " " " " "
1892–6	30	
1892–6	30	R. Hundhausen, Hamm, Aleuronat (pure)
1906	8	" " " (less pure)
1906	8	Jireh Diabetic Food Co., New York, Diabetic Flour
1913		" " " " " "
1913		" " " " Flour
		" " " " Patent Barley
1913		" " " " " Cotton Seed Flour
1913		" " " " " Lentils Flour
1913		" " " " Protein Flour
1913		" " " " Soja Bean Flour
1906	8	" " " " Wheat and Barley Flour
1906	8	" " " " " " " "
1906	8	Johnson Educator Food Co., Boston, Mass., Educator Standard Gluten
1911	14	Flour
1911	38	Johnson Educator Food Co., Boston, Mass., Educator Standard Gluten
1904	39	Flour
		Johnson Educator Food Co., Boston, Mass., Educator Standard Gluten
1909	19	Flour
1912	16	" " " " " "
		The Kellogg Food Co., Battle Creek, Mich., 20% Gluten Meal
1906	8	" " " " " "
1906	8	" " " " " "
1909	19	The Kellogg Food Co., Battle Creek, Mich., 40% Gluten Flour
1912	16	" " " " " "
1913		" " " " " "
		" " " " " "
1909	19	" " " " " "
		" " " " " " Self-Raising
1909	19	" " " 80% Gluten
1912	16	" " " " "
1913		Eugene Loeb, New York, Gluten Cracker Meal
1913		" " " Imported Gluten Flour

OF DIABETIC FOODS.—*Continued.*

No. of Pieces.	Net weight of package.	Cost per package.	Cost per pound.	Water.	Ash.	Protein (Nx6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
	gms.	cts.	cts.	%	%	%	%	%	%	%	gms.	
..	....	...	...	8.0	1.1	35.3	55.0		0.6	....	10+	367
..	....	...	...	8.7	..	36.6	..	...	...	....	?	...
..	847	35	19	8.2	1.4	39.9	0.7	47.5	2.3	36.9	11	370
..	855	30	16	8.8	4.9	37.3	0.5	47.3	1.2	37.7	11	349
..	....	...	...	10.6	0.7	36.6	0.3	50.9	0.9	*50.0	10	358
..	839	40	22	8.0	0.9	42.7	0.3	46.4	1.7	36.3	11	372
..	500	50	45	3.0	5.0	42.3	5.4	24.5	19.8	Trace	21	446
..	....	...	...	6.2	0.8	62.4	0.2	29.5	0.9	*27.5	18	376
..	889	50	26	6.1	0.5	80.3	0.4	11.1	1.6	7.0	48	380
..	....	...	...	8.5	0.9	86.1	..	4.0	0.5	....	133	365
..	....	...	...	9.1	1.2	77.7	0.2	10.6	1.2	....	50	364
..	....	...	...	9.3	1.3	14.3	1.0	71.9	2.2	*66.6	7	365
..	....	...	...	11.0	1.3	12.1	1.1	72.7	1.8	....	7	355
..	1144	30	12	7.6	1.4	14.4	1.4	72.9	2.3	60.9	7	370
..	475	25	24	5.0	1.1	11.4	0.7	80.2	1.6	67.8	7	381
..	495	20	18	7.4	5.5	49.1	4.0	21.3	12.7	6.0	25	396
..	469	25	24	5.9	2.5	27.3	3.3	59.8	1.2	42.6	9	359
..	1124	50	20	7.3	1.7	31.4	0.9	56.7	2.0	48.5	9	370
..	457	30	30	4.4	4.6	42.3	4.7	25.8	18.2	0.0	21	435
..	....	...	...	9.7	1.5	11.8	1.6	73.5	1.9	*66.2	7	358
..	....	...	...	9.5	1.6	11.3	1.4	74.4	1.8	....	7	359
..	....	...	...	11.3	1.0	26.4	0.4	59.2	1.7	*56.8	9	358
..	1358	38	13	7.3	0.8	40.1	0.2	50.2	1.4	40.9	11	374
..	....	...	...	8.8	..	40.1	..	...	...	....	?	...
..	....	...	...	10.5	1.0	15.8	0.4	71.7	0.6	57.4	7	355
..	....	...	...	8.9	1.1	21.0	68.2		0.8	....	8+	364
..	428	25	26	9.8	1.4	27.5	0.1	60.7	0.5	49.6	8	357
..	....	...	...	10.5	0.5	40.3	0.2	47.3	1.2	*46.9	11	361
..	....	...	...	8.5	1.4	38.4	0.1	50.4	1.2	*50.0	11	366
..	....	...	...	7.9	1.2	39.0	50.1		1.8	....	11+	373
..	320	50	71	9.7	1.4	47.0	0.2	40.8	0.9	31.9	13	359
..	414	50	55	8.0	1.2	43.7	0.2	46.0	0.9	40.5	11	367
..	....	...	...	8.8	1.3	38.7	50.2		1.0	....	11+	365
..	....	...	...	7.2	0.6	78.8	12.5		0.9	....	42+	373
..	425	60	64	9.1	0.6	81.3	0.2	7.9	0.9	6.2	67	365
..	134	15	51	9.7	1.0	27.8	0.2	53.5	7.7	40.2	10	394
..	....	...	40	9.2	1.4	76.3	0.4	11.8	0.9	4.4	45	361

* Determined by the diastase method, without previous washing with water, and calculated as starch.

TABLE I.—ANALYSES

Date of Analysis.		Manufacturer and Brand.
		FLOURS AND MEALS. *(cont.)*
1913		Eugene Loeb, New York, Pure Gluten Flour
1913		" " " Whole Wheat Flour
1913		E. Loeb & Co., New York, Gluten Flour
1913		Thos. Martindale & Co., Philadelphia, Special Gluten Flour
1913		Mayflower Mills, Fort Wayne, Ind., Bond's Diabetic Flour
1906	8	Theo. Metcalf Co., Boston, Mass., Soja Bean Meal, 5.5% Starch
1906	8	" " " " " 7.6% "
1913		" " " " " 18.0% "
1906	8	" " Vegetable Gluten, 20.0% "
1913		" " " " 8.1% "
1901–2	44	H. Niemöller, Gütersloh, Roborat
1913		Pieser-Livingston Co., Chicago, Gluten Flour
1913		" " " " "
1904	7	Pure Gluten Food Co., New York, Gum Gluten Flour
1911	14	" " " " " " "
1902–3	2	Pure Gluten Food Co., New York, Gum Gluten Ground
1904	39	" " " " " " "
1906	8	" " " " " " "
1901	2	" " " " " " Self-Raising
1906	8	" " " " " " "
1906	8	Pure Gluten Food Co., New York, Hoyt's Gum Gluten
1901	36	" " " " Plain Gluten Flour
1911	38	" " " " Pure Gluten Flour
1911	38	" " " " " " "
1913		Rademann's Nährmittelfabrik, Frankfurt, Diabetiker Mehl
1895	1	Ralston Health Food Co., Gluten Flour
1902–3	2	" " " " "
1913		Sprague, Warner & Co., Chicago, Richelieu Gluten Flour
1913		G. Van Abbott & Sons, London, Almond Flour
1913		" " " Gluten Flour
1913		" " " Gluten Semola
1911	38	Wilson Bros., Rochester, N. Y., Gluten Flour, 4/7 Standard
1911	38	" " " " " "
1913		" " " " " "
1913		" " " " " Self-Raising, 4/7 Standard.
		PROTEIN PREPARATIONS.
1912	17	The Bauer Chemical Co., Berlin, Sanatogen
1900–1	27	Eiweiss-Extrakt Co., Altona, Germany, Soson

OF DIABETIC FOODS.—*Continued.*

No. of Pieces.	Net weight of package.	Cost per package.	Cost per pound.	Water.	Ash.	Protein (Nx6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
	gms.	cts.	cts.	%	%	%	%	%	%	%	gms.	
..	423	20	21	10.1	0.6	40.3	0.3	46.3	2.4	39.6	11	368
..	424	10	11	11.1	1.1	14.6	0.5	70.5	2.2	54.6	8	360
..	453	50	50	9.8	0.5	43.9	0.3	44.4	1.1	39.8	12	363
..	900	30	15	8.2	0.6	40.3	0.3	49.1	1.5	41.4	11	371
..	1445	30	9	9.4	0.6	40.2	0.2	48.3	1.3	40.6	11	366
..	....	...	...	7.8	4.4	39.9	3.9	24.9	19.1	*9.0	21	431
..	....	...	...	...	..	36.8	..	...	...	....	?	...
..	453	50	50	6.5	4.1	41.0	3.4	25.0	20.0	....	21	444
..	....	...	...	7.9	0.7	61.4	0.3	28.1	1.6	*26.8	19	372
..	453	50	50	7.6	0.5	80.4	0.2	9.8	1.5	5.9	54	374
..	....	...	...	9.5	1.4	82.3	0.2	2.9	3.7	....	183	374
..	....	...	...	8.5	0.6	43.3	0.1	46.2	1.3	38.4	11	370
..	1358	43	14	8.7	0.6	41.8	0.2	47.3	1.4	36.5	11	369
..	....	...	...	...	..	54.3	..	...	...	....	?	...
..	464	15	15	8.1	1.0	38.3	0.2	50.8	1.6	42.4	10	371
..	....	...	...	11.9	0.9	26.8	59.0		1.4	....	9+	356
..	....	...	...	10.6	0.8	44.1	0.4	42.8	1.3	30.0	12	359
..	....	...	...	6.9	1.0	50.1	0.5	39.6	1.9	*38.6	13	376
..	....	...	...	9.8	3.8	31.5	0.3	53.2	1.4	....	10	351
..	....	...	...	10.8	4.5	37.9	0.5	45.3	1.0	*42.9	12	342
..	....	...	...	11.2	1.0	31.8	0.3	54.1	1.6	*52.0	10	358
..	....	...	...	9.9	0.6	53.6	0.2	34.5	1.2	....	15	363
..	....	...	...	...	..	37.9	..	...	...	....	?	...
..	....	...	...	9.1	..	39.3	..	...	...	....	?	..
										46.8		
..	246	20	37	9.6	0.8	37.9	0.2	50.7	0.8	....	11	362
..	....	...	...	12.8	0.6	15.0	0.6	69.0	2.0	....	8	354
..	....	...	...	11.9	0.9	15.8	70.9		0.5	31.6	7+	351
..	1357	69	23	8.7	0.5	49.7	0.2	39.7	1.2		13	368
										0.0		
..	480	48	45	4.0	3.0	24.6	1.9	7.9	58.6	12.4	67	657
..	902	144	72	10.2	0.8	75.1	0.4	12.6	0.9	28.2	42	359
..	....	60	...	10.1	2.8	51.4	0.4	32.4	2.9	....	16	361
..	....	...	...	11.1	..	19.9	..	...	...	....	?	...
..	....	...	...	9.7	..	19.5	..	...	...	54.6	?	...
..	....	...	10	11.0	1.2	20.8	0.3	64.6	2.1	51.8	8	361
..	1296	25	9	12.2	4.6	17.4	0.3	63.5	2.0		8	342
..	200	190	431	10.0	5.6	80.1	4.2		0.1	....	126+	338
..	....	...	...	6.4	1.0	91.2	1.1		0.3	....	482+	372

* Determined by the diastase method, without previous washing with water, and calculated as starch.

TABLE I.—ANALYSES

Date of Analysis.		Manufacturer and Brand.
		PROTEIN PREPARATIONS. (cont.)
1902	29	Krecke & Co., Salzuflen, Energin
1913		Menley & James, New York, Glidine
1899–1900	28	Plasmon Co., London, Plasmon, (average 9 analyses)
1901	36	" " "
1908	11	" " "
1909	19	" " "
1898–1900	27	Troponwerke, Mülheim, Tropon, (average of many analyses)
1901	36	" " "
		SOFT BREADS.
1913		Ferguson Bakery, Boston, Mass., Gluten Bread
1892	26	Frank & Co., Bockenheim, Proteïn-Roggenbrot
1892	26	" " Proteïn-Weizenbrot
....	23	Fritz, Vienna, Aleuronatbrot
1910	20	" " Kleberbrot, Schwarz
1910	20	" " Litonbrot
1910	20	Fromm & Co., Dresden, Conglutinbrot
1910	20	" " " Litonbrot
1910	20	Gericke, Potsdam, Doppel-Porterbrot
1910	34	" " " "
1910	34	" " Dreifach-Porterbrot
1910	34	" " Einfach-Porterbrot
1910	34	" " Sifarbrot
1910	34	Karl Goldscheider, Carlsbad, Sinamylbrot
1910	34	Gumpert, Berlin, Diabetiker-Doppel-Schwarzbrot
1910	34	" " " " "
1910	34	" " " " -Weissbrot
1910	34	" " " Einfach-Schwarzbrot
1910	34	" " " " -Weissbrot
1910	34	" " Ultrarbot
1892	22	F. Günther, Frankfurt, Kleberbrot
1906	8	Health Food Co., New York, Glutosac Bread

OF DIABETIC FOODS.—*Continued.*

No. of Pieces.	Net weight of package.	Cost per package.	Cost per pound.	Water.	Ash.	Protein (Nx6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread	Calculated Calories per 100 gms.
	gms.	cts.	cts.	%	%	%	%	%	%	%	gms.	
..	....	...	...	9.1	1.0	83.8	0.3	1.3	4.5	....	408	381
..	284	150	240	5.7	0.9	91.4	0.2	1.0	0.8	0	530	377
..	....	...	...	11.9	7.5	70.2	9.7		0.7	....	55+	326
..	....	...	...	8.5	7.4	75.0	8.9		0.2	....	60+	337
..	128	35	124	12.4	7.7	70.3	9.2		0.4	....	58+	322
..	....	...	...	10.9	7.6	78.7	0.0		2.7	....	...	339
..	....	...	...	9.3	1.2	86.6	2.7		0.2	....	196+	359
..	....	...	...	9.2	0.8	88.5	1.2		0.3	....	442+	362
1	476	20	19	37.2	1.7	24.2	0.2	33.6	3.1	25.2	16	259
..	....	...	...	32.0	2.8	23.7	2.3	33.0	6.2	....	16	283
..	....	...	...	31.9	2.7	23.4	2.2	33.5	6.3	....	16	284
..	....	...	...	35.5	1.3	15.6	0.2	46.6	0.8	....	11	256
1	114	...	...	...	..	21.5	..	48.6	...	....	11	...
1	229	...	...	...	..	38.6	..	15.4	...	....	34	...
1	273	...	...	...	..	18.3	..	47.3	...	....	11	...
1	355	...	...	...	..	35.8	..	14.3	...	....	37	...
1	145	...	...	38.6	..	26.9	..	35.1	...	....	15	...
..	....	...	...	38.9	1.1	21.9	36.7		1.5	....	14+	248
..	....	...	...	35.1	1.3	30.7	0.4	26.0	6.5	19.8	20	285
..	....	...	...	30.5	1.6	17.8	48.2		1.8	....	11+	280
..	....	...	...	39.6	2.2	37.3	0.6	15.0	5.3	12.3	35	257
..	....	...	...	39.1	3.5	28.2	4.4	20.2	4.6	17.3	26	235
..	....	...	...	25.6	1.6	18.5	0.5	42.0	11.8	39.4	13	348
..	....	...	...	27.9	1.6	15.9	42.0		12.7	....	13+	346
..	....	...	...	23.7	2.3	18.8	0.4	39.4	15.4	36.8	13	371
..	....	...	...	30.1	1.4	15.6	49.5		3.4	....	11+	291
..	....	...	...	29.4	1.5	16.2	46.4		6.5	....	11+	309
..	....	...	...	27.9	3.1	28.2	0.8	7.8	32.2	6.8	68	434
..	....	...	...	33.7	2.4	17.2	0.7	45.5	0.5	....	12	255
..	....	...	...	31.5	1.9	27.4	0.4	36.1	2.7	*29.9	15	278

* Determined by the diastase method, without previous washing with water, and calculated as starch.

Table I.—Analyses

Date of Analysis.		Manufacturer and Brand.
		Soft Breads. *(cont.)*
1906	8	Health Food Co., New York, Protosac Bread
1892–6	21	R. Hundhausen, Hamm, Aleuronatbrot, low gluten
1906	8	Jireh Diabetic Food Co, New York, Whole Wheat Bread
1913		“ “ “ “ “ “ “ (not fresh)
1913		Eugene Loeb, New York, P. & L. Genuine Gluten Bread
1910	34	Rademann's Nährmittelfabrik, Frankfurt, Diabetiker-Grahambrot
1910	20	“ “ “ “ Schwarzbrot (dry)
1910	34	“ “ “ “ “
1910	34	“ “ “ “ “
1910	20	“ “ “ “ Weissbrot (dry)
1910	34	“ “ “ “ “
1910	20	“ “ “ “D.-K” Brot (dry)
1892	26	“ “ “ Erdnuss-Brot
1910	34	“ “ “ Litonbrot
1894	22	Schelte, Münster, Aleuronatbrot
1910	20	Seidl, München, Aleuronatbrot
1910	20	“ “ Kleberbrot
1899	33	Troponwerke, Mülheim, Tropon-Brot
		Hard Bread and Bakery Products.
1907	10	Bischof & Co., London, Diabetic Gluten Bread
1907	10	“ “ “ Essentiel Bread for Super Alimentation
1910	13	Brusson Jeune, Villemur, France, Gluten Bread
1912	16	“ “ “ “ “ “
1909	19	Callard, Stewart & Watt, London, Almond Biscuit, Plain
1909	19	“ “ “ “ Almond Shortbreads
1906	8	“ “ “ “ Casoid Biscuits, No. 1
1909	19	“ “ “ “ “ “ “
1913		“ “ “ “ “ “ “
1908	12	“ “ “ “ “ “ No. 2
1909	19	“ “ “ “ “ “ “
1908	12	Callard, Stewart & Watt, London, Casoid Biscuits No. 3
1909	19	“ “ “ “ “ “ “
1908	12	“ “ “ “ “ Dinner Rolls
1909	19	“ “ “ “ “ “ “
1909	19	“ “ “ “ “ Lunch Biscuit

OF DIABETIC FOODS.—*Continued.*

No. of Pieces.	Net weight of package.	Cost per package.	Cost per pound.	Water.	Ash.	Protein (Nx6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
	gms.	cts.	cts.	%	%	%	%	%	%	%	gms.	
..	....	...	...	27.3	1.4	32.5	0.2	37.0	1.6	*33.1	14	292
..	....	...	...	39.6	1.6	17.3	0.6	40.6	0.3	....	13	234
..	....	...	...	39.2	1.8	9.4	0.6	48.6	0.4	*43.8	11	236
1	....	...	10	21.8	2.5	12.4	0.6	62.0	0.7	44.9	9	304
1	321	10	14	31.4	1.6	10.4	0.3	53.7	2.6	44.2	10	280
..	....	...	...	31.7	1.8	9.8	2.1	49.4	5.1	45.6	11	283
1	196	...	...	...	..	37.8	..	33.3	..	....	16	...
..	....	...	...	29.1	1.9	14.5	1.4	50.5	2.5	45.8	10	283
..	....	...	...	33.6	1.9	14.9	47.6		1.9	....	11+	267
1	128	...	...	...	..	43.4	..	28.1	...	....	19	...
..	....	...	...	33.8	1.9	23.3	0.4	40.1	0.5	37.0	13	258
1	217	...	...	...	..	12.3	..	58.9	...	....	9	...
..	....	...	...	24.6	3.8	33.6	5.5	19.7	12.8	....	27	328
..	....	...	...	42.6	2.4	30.2	0.7	21.6	2.5	17.5	25	230
..	....	...	...	38.8	1.3	18.3	0.9	40.1	0.6	....	13	239
1	164	...	...	28.0	..	21.9	..	47.3	0.3	....	11	280
1	138	...	...	24.2	..	18.6	..	54.4	0.7	....	10	298
..	....	...	...	42.1	..	19.5	..	...	...	....	?	...
..	....	...	...	7.4	4.7	73.1	0.0	14.3	0.5	....	37	354
..	....	...	...	7.3	4.8	26.6	0.1	59.6	1.6	....	9	359
1	30	10	150	7.8	1.1	32.1	0.2	57.0	1.8	....	9	373
1	34	10	133	12.7	0.8	37.3	0.3	47.1	1.8	49.8	11	354
..	....	...	...	3.7	3.2	28.3	36.8		28.0	40.1	14+	512
..	....	...	...	4.2	3.5	19.5	20.7		52.1	....	26+	630
..	....	...	...	7.8	3.9	63.0	8.0		17.3	*8.1	66+	444
..	....	...	...	7.2	2.5	64.8	8.7		16.8	....	61+	445
54	226	150	300	4.8	3.4	66.8	0.4	5.8	18.8	4.0	91	460
..	....	...	...	...	..	58.1	..	...	...	0.0	?	...
..	....	150	...	7.5	3.6	57.8	5.6		25.5	....	95+	483
..	....	...	...	...	..	54.7	..	...	...	Trace	?	...
..	....	150	...	7.9	5.0	54.3	7.8		25.0	....	68+	473
..	....	...	...	...	..	80.8	..	...	...	†3.3	?	...
..	....	150	...	7.0	1.8	78.0	2.1		11.1	....	252+	420
..	....	...	...	4.2	3.8	25.5	21.6		44.9	....	25+	593

* Determined by the diastase method, without previous washing with water, and calculated as starch.

† By direct acid hydrolysis, calculated as starch.

TABLE I.—ANALYSES

Date of Analysis.		Manufacturer and Brand.
		HARD BREADS AND BAKERY PRODUCTS. *(cont.)*
1909	19	Callard, Stewart & Watt, London, Casoid Rusks
1909	19	Callard, Stewart & Watt, London, Cocoanut Biscuit + Saccharin
1909	19	" " " " Ginger Biscuit + Saccharin
1909	19	" " " " Kalari Batons
1913		" " " " " "
1909	19	" " " " " Biscuits
1909	19	" " " " Prolactic Biscuit
1913		Charrasse Biscuits Croquettes au Gluten
1913		" Biscottes Lucullus
1913		" Gluten Exquis Biscuits aux Amandes
1913		" Gluten Fleur de Neige Pain
1913		" Mignonettes au Gluten
1913		" Pain de Gluten
1913		" Tranches Grillées pour Potage
1892	26	Frank & Co., Bockenheim, Erdnuss-Kakes
1910	20	Fritz, Vienna, Braunes Luftbrot "B"
1910	20	" " Mandelbrot
1913		Fromm & Co., Dresden, Almond-form Wafers with Chocolate
1913		" " Butterbrezeln
1913		" " Crackers
1913		" " Eierbiscuit
1910	20	" " Eiweissbrot
1913		" " Hazelnuss-Stangen
1913		Fromm & Co., Dresden, Luft Bread
1913		" " Makronen
1913		" " Salz-Stangen
1913		" " Stangenin
1910	20	" " Uni Bread
1913		" " " "
1910	20	Gericke, Potsdam, Doppel-Porterzwieback
1910	34	" " " "
1910	20	" " Mandelbrot
1910	20	" " Porterbiskuits
1910	20	" " Porterzwieback
1910	20	" " Sifarbiskuits
1910	34	Groetzsch, Frankfurt, Diabetiker-Salsbrezeln

OF DIABETIC FOODS.—*Continued.*

No. of Pieces.	Net weight of package.	Cost per package.	Cost per pound.	Water.	Ash.	Protein (Nx6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
	gms.	cts.	cts.	%	%	%	%	%	%	%	gms.	
..	....	...	...	5.4	4.5	37.0	20.8		32.3	....	25+	522
..	....	...	...	2.6	3.1	16.6	16.4		61.3	....	38+	684
..	....	...	...	2.5	3.7	17.1	18.1		58.6	....	29+	668
..	....	...	...	8.1	4.4	52.9	0.9		33.7	....	(?) 589	519
30	320	150	213	4.5	5.2	43.2	0.7	7.4	39.0	0	69	553
..	....	...	...	6.3	3.7	56.9	1.7		31.4	....	312+	517
..	....	...	...	6.3	4.0	42.9	19.3		27.5	....	27+	496
97	194	135	316	7.3	0.5	34.3	0.2	52.3	5.4	30.6	10	395
37	530	95	81	7.5	1.8	11.4	0.2	73.4	5.7	59.2	7	391
24	189	150	360	5.3	1.6	18.1	0.6	50.6	23.8	25.5	10	489
21	146	115	357	6.1	2.3	35.9	0.4	42.8	12.5	25.1	12	427
47	116	90	352	8.2	2.1	40.1	0.3	43.6	5.7	27.3	12	386
15	481	150	141	8.1	2.1	40.8	0.2	43.5	5.3	27.2	12	385
Sliced Bread	81	60	336	7.7	2.3	40.6	0.3	45.5	3.6	28.8	12	377
..	....	...	...	6.4	2.7	32.2	3.1	36.5	19.1	....	15	447
1	29	...	...	...	..	42.6	..	19.8	...	....	27	...
1	45	...	...	...	..	15.4	..	23.1	...	....	23	...
54	125	65	236	2.6	1.0	4.8	0.3	62.3	29.0	14.0	8	529
18	123	35	129	6.3	2.0	12.3	0.2	62.7	16.5	43.1	8	449
23	91	25	125	7.4	3.4	12.9	0.2	68.4	7.7	58.2	8	395
8	80	35	198	7.7	1.3	18.8	0.2	60.6	11.4	37.5	9	420
1	13	...	...	...	..	45.5	..	37.5	..	....	14	...
15	104	35	153	5.2	2.9	13.4	1.7	60.8	16.0	0.0	9	441
18	263	135	233	8.3	8.9	50.9	0.2	30.7	1.0	23.4	17	335
24	159	65	185	6.0	3.0	14.1	1.3	56.2	19.4	0.0	9	456
36	156	35	102	6.2	3.6	13.0	0.4	61.2	15.6	39.1	9	437
42	161	35	99	6.6	1.6	14.0	0.4	64.4	13.0	51.6	8	431
1	12	...	...	...	..	71.3	..	8.6	...	....	62	...
18	272	135	225	8.1	5.6	71.7	3.5	9.4	1.7	2.9	56	340
13	72	...	...	...	..	19.1	...	41.0	...	....	13	...
..	....	...	...	4.9	1.7	34.2	39.7		19.5	....	13+	471
12	94	...	...	...	..	16.2	..	43.3	...	....	12	...
10	31	...	...	...	..	16.1	..	63.0	...	....	8	...
13	69	...	...	...	..	26.4	..	72.0	...	....	7	...
6	64	...	...	...	..	20.2	..	35.3	...	....	15	...
..	....	...	...	14.0	3.3	36.3	17.1		29.3	....	31+	477

TABLE I.—ANALYSES

Date of Analysis.	Manufacturer and Brand.
	HARD BREADS AND BAKERY PRODUCTS. *(cont.)*
1910 34	Groetzsch, Frankfurt, Diabetiker-Salzbrezeln ....
1910 34	" " Pfeffernüsse ....
1910 34	" " " ....
1910 34	Gumpert, Berlin, Diabetiker-Stangen ....
1910 34	" " Doppel-Diabetiker-Zwieback ....
1892 24	F. Günther, Frankfurt, Aleuronat-Kakes ....
1892 24	" " " " ....
1897 25	" " " " ....
1913	Health Food Co., New York, Alpha Best Diabetic Wafer ....
1906 8	" " " Diabetic Biscuit ....
1913	" " " " " ....
1913	" " " Gluten Nuggets ....
1906 8	" " " Glutona ....
1906 8	Health Food Co., New York, Glutosac Butter Wafers ....
1906 8	" " " " Rusks ....
1906 8	" " " " Wafers, Plain ....
1906 8	" " " " Zwieback ....
1906 8	" " " No. 1 Proto Puffs ....
1913	" " " " " " ....
1911 14	Health Food Co., New York, No. 2 Proto Puffs ....
1913	" " " " " " ....
1906 8	" " " Protosac Rusks ....
1913	" " " Protosoy Diabetic Wafers ....
1906 8	" " " Salvia Sticks ....
1912 41	Heintz Food Co., Chicago, Gluten Biscuits ....
1913	" " " " " ....
1913	" " " Glutin Biscuits ....
1892–6 31	R. Hundhausen, Hamm, Aleuronatzwieback, high gluten ....
1892–6 31	" " " low gluten ....
1894 22	" " Aleuronat-Biskuits ....
1891 22	" " " -Kakes ....
1912 16	Huntley & Palmer, London, Akoll Biscuits ....
1913	" " " " " ....
1906 8	Jireh Diabetic Food Co., New York, Diabetic Biscuits ....
1906 8	" " " " " " ....
1906 8	" " " " " Rusks ....
1913	" " " " Dietetic Biscuits ....
1913	" " " " " Rusks ....
1906 8	" " " " Wheat Nuts ....
1906 8	" " " " " " ....

OF DIABETIC FOODS.—*Continued.*

No. of Pieces.	Net weight of package.	Cost per package.	Cost per pound.	Water.	Ash.	Protein (Nx6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
	gms.	cts.	cts.	%	%	%	%	%	%	%	gms.	
..	....	...	...	5.3	1.6	34.5	0.3	22.9	35.4	....	23	548
..	....	...	...	25.2	2.8	38.7	9.3		24.0	....	57+	408
..	....	...	...	15.2	2.6	39.2	0.7	10.3	32.0	....	51	486
..	....	...	...	5 5	2 9	31.1	11.0		49.5	....	48+	614
..	....	...	...	4.6	2 5	32.5	0.8	27.6	32.1	27.1	19	529
..	....	...	...	5.1	0.8	14.9	0.4	69.5	9.3	....	8	421
..	....	...	...	4.5	1 6	17.8	0.9	67.3	7.9	....	8	412
..	....	...	...	4.5	1.5	15.3	70.0		8.7	....	8+	420
17	88	50	258	4.9	3.6	66.1	0.5	11.3	13.6	Trace	47	432
..	....	...	...	4 7	3.1	28.1	0.3	54.8	9.0	*51 1	10	413
22	321	25	35	8 9	2.5	25.0	0.2	54.2	9 2	46.5	10	400
77	360	35	44	5 7	2 8	30.2	0.2	48.3	12.8	38.6	11	429
..	....	...	...	4.8	2.5	22.1	0.3	58.5	11.8	*54.9	9	429
..	....	...	...	4.7	3.8	27.6	1.6	49.4	12.9	*41.2	11	424
..	....	...	...	4.5	2.7	36.5	0.9	51.6	3.8	*42.5	10	387
..	....	...	...	6.1	3.5	29.4	1.5	49.9	9.6	*41 6	11	404
..	....	...	...	7.6	2.5	32.5	1.2	49.3	6 9	*40.9	11	389
..	....	...	...	8 6	1.3	75.9	0.1	13.1	1.0	*9.9	40	365
10	141	35	113	7 2	2.7	76.3	0.2	10 7	2.9	4.3	50	374
..	161	25	71	8 2	1.8	52 4	0.2	35.9	1.5	27.2	15	367
8	119	25	95	7.9	2.5	56.6	0 2	30.7	2.1	19.0	17	368
..	....	...	...	5 9	2 0	40.9	0 5	48.7	2.0	*43 9	11	376
43	168	40	108	3.9	5 0	43.1	1 9	21.2	24 9	4 7	25	481
..	....	...	...	6.6	7.5	39.2	1.9	24.0	20.8	*18.7	22	440
..	....	...	...	...	..	13.1	..	...	...	....	?	...
28	278	25	41	6.4	3.5	12.8	1.3	57.7	18.3	21.4	9	447
26	259	25	44	7.3	3.0	14.5	1.0	67 0	7.2	45.5	8	391
..	....	...	...	8.5	2 6	66.2	17.7		5 0	....	30+	381
..	....	...	...	6 5	1 6	22.9	0.8	59 6	8.6	....	9	407
..	....	...	...	6.6	4.7	24.8	0.5	52.2	11.2	....	10	409
..	....	...	...	3 4	1.1	20 1	1.2	64.8	9.4	...	8	424
..	113	22	88	9.3	3.9	53.2	0.4	6.3	26.9	Trace	84	480
58	302	70	105	7.2	3.4	54.5	0.7	6.8	27.4	Trace	78	492
..	....	...	...	6.3	2 0	14 8	0.9	72 3	3.7	*65.4	7	382
..	....	...	...	8.9	2.3	13.1	1.2	70.6	3.9	....	7	370
..	....	...	...	8.7	3 1	14 6	0.9	67.7	5.0	....	8	374
42	460	30	30	5 4	2.0	13 2	1.2	70.8	7.4	49 6	7	403
17	231	30	59	5 4	1 9	14.9	1.1	68.0	8.7	47 0	8	410
..	....	...	...	7 6	2.3	19 0	1 0	54.5	15.6	*50.1	10	434
..	....	...	...	6.0	3.2	21.0	1.2	46.3	22.3	....	11	470

* Determined by the diastase method, without previous washing with water, and calculated as starch.

TABLE I.—ANALYSES

Date of Analysis		Manufacturer and Brand.
		HARD BREADS AND BAKERY PRODUCTS. *(cont.)*
1906	8	Johnson Educator Food Co., Boston, Almond Biscuits ....
1906	8	" " " " Diabetic Biscuits ....
1906	8	" " " " Educator Crackers, Greseni Gluten
1913		" " " " " Gluten Bread Sticks..
1911	14	" " " " Gluten Cookies ....
1906	8	" " " " " Rusk, Greseni Gluten ....
1906	8	" " " " " Wafers ....
1906	8	" " " " Glutine, Greseni Gluten ....
1899	35	" " " " " " " ....
1912	16	The Kellogg Food Co., Battle Creek, Mich., Avena-Gluten Biscuit .....
1906	8	" " " " Potato Gluten Biscuit ....
1909	19	" " " " " " " ....
1913		" " " " " " " ....
1906	8	" " " " Pure Gluten Biscuit ......
1909	19	" " " " " " " ......
1913		The Kellogg Food Co., Battle Creek, Mich., Taro-Gluten Biscuit ......
1906	8	" " " " 40% Gluten Biscuit ......
1909	19	" " " " " " " ......
1911	14	" " " " " " " ......
1912	16	" " " " " " " ......
1913		" " " " " " " ......
1912	16	" " " " 80% Gluten Biscuit ......
1895	22	Kirche, Düsseldorf, Aleuronat-Kakes ....
1910	34	Klopfer Chemische Fabrik, Dresden, Glidinebrot....................
1913		Eugene Loeb, New York, Gluten Luft Bread ....
1913		Pure Gluten Food Co., New York, Gum Gluten Biscuit Crisps ....
1893	26	Rademann's Nährmittelfabrik, Frankfurt, Diabetiker-Biskuits ....
1913		" " " " " ....
1913		" " " " Bretzel ....
1910	20	" " " " Cakes ....
1913		" " " " " ....
1893	22	Rademann's Nährmittelfabrik, Frankfurt, Diabetiker-Chokolade-Biskuits
1913		" " " " Dessert-Gebäck ..
1910	20	" " " " Makronen ....
1910	34	" " " " " ....
1913		" " " " " ....
1910	20	" " " " Stangen ....
1910	34	" " " " " ....
1913		" " " " " ....

OF DIABETIC FOODS.—*Continued.*

No. of Pieces.	Net weight of package.	Cost per package.	Cost per pound.	Water.	Ash.	Protein (Nx6.25). (See page 15.)	Fiber.	Nitrogen-free Extract. (See page 15.)	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
	gms.	cts.	cts.	%	%	%	%	%	%	%	gms.	
..	....	...	...	5.3	2.1	29.0	0.5	54.3	8.8	*50.0	10	412
..	....	...	...	5.9	1.9	25.3	0.4	59.0	7.5	*54.9	9	405
..	....	...	...	6.2	2.9	23.0	0.2	63.1	4.6	*57.9	8	386
12	208	30	65	8.4	2.4	35.9	0.3	45.8	7.2	37.5	12	392
23	259	25	44	4.8	2.7	26.4	0.3	49.8	16.0	37.8	11	449
..	....	...	...	6.2	3.0	22.1	0.3	68.1	0.3	*63.3	8	364
..	....	...	...	6.9	0.9	30.3	0.3	61.2	0.4	*57.0	9	370
..	....	...	...	6.4	2.6	21.9	0.6	67.7	0.8	*63.1	8	366
..	....	...	...	10.2	1.1	13.8	74.0		0.9	....	7+	359
..	349	25	33	7.9	2.1	21.4	0.4	55.5	12.7	41.1	10	422
..	....	...	...	8.2	0.8	80.0	0.0	10.6	0.4	*9.8	50	366
..	....	...	...	7.6	0.9	75.6	13.3		2.6	....	40+	379
92	207	30	66	8.8	0.8	41.5	0.4	48.0	0.5	39.5	11	363
..	....	...	...	7.5	1.0	80.3	0.2	10.2	0.8	*9.1	52	369
..	....	...	...	8.2	1.1	48.3	39.1		3.3	....	14+	379
29	106	30	128	9.4	0.7	31.3	0.4	57.7	0.5	48.2	9	361
..	....	...	...	7.5	1.6	35.8	0.1	54.0	1.0	*52.6	10	368
..	....	...	...	7.5	1.4	36.4	51.9		2.8	....	10+	378
..	244	40	74	8.0	1.6	43.3	0.2	45.7	1.2	35.3	12	367
37	89	25	129	10.2	0.5	47.5	0.2	41.1	0.5	35.0	13	359
24	219	50	104	7.2	1.3	37.2	0.3	53.2	0.8	45.0	10	369
70	190	30	72	10.1	2.1	82.4	0.1	4.4	0.9	4.7	118	355
										....		
..	....	...	...	5.0	0.9	17.0	1.6	61.8	13.7	32.8	9	439
..	....	...	...	12.7	2.3	47.6	0.3	34.9	2.2	44.1	15	350
3	135	25	84	7.3	1.0	27.9	0.4	54.2	9.2	39.3	10	411
16	106	25	107	5.3	1.7	42.9	0.9	48.5	0.7	10.0	11	372
..	....	...	...	2.9	3.5	44.1	..	19.7	29.8	25.9	27	523
13	105	35	151	5.0	1.1	29.6	0.2	44.5	19.6	40.7	12	473
16	78	25	145	6.8	3.0	31.4	0.2	50.1	8.5	....	11	402
10	64	...	...	...	..	12.6	..	39.8	...	39.1	13	...
19	96	35	165	6.5	3.0	29.6	0.2	47.2	13.5		11	429
										11.8		
..	....	...	...	1.8	3.8	44.9	..	21.9	27.6	5.9	24	516
17	117	65	252	4.3	2.5	22.2	1.1	27.5	42.4	....	19	580
10	52	...	...	...	..	12.3	..	11.3	...	8.8	47	...
..	....	...	...	4.5	3.2	22.3	1.1	20.9	48.0	3.0	25	605
14	62	45	329	4.0	3.0	23.2	1.2	20.6	48.0	....	26	607
10	112	...	...	...	..	22.7	..	17.0	...		31	...
..	....	...	...	10.5	2.1	29.8	24.6		33.0	....	22+	515
13	123	42	155	4.5	3.6	17.7	0.5	29.5	44.2	21.4	18	586

* Determined by the diastase method, without previous washing with water, and calculated as starch.

TABLE I.—ANALYSES

Date of Analysis.		Manufacturer and Brand.
		HARD BREADS AND BAKERY PRODUCTS. *(cont.)*
1910	20	Rademann's Nährmittelfabrik, Frankfurt, Diabetiker-Zwieback ....
1910	34	" " " " " ....
1893	22	" " " Erdnuss-Biskuits ....
1910	34	" " " Käsestangen ....
1913		" " " " ....
1910	20	Rademann's Nährmittelfabrik, Frankfurt, Sanitätszwieback ....
1897	25	Schelle, Braunschweig, Aleuronat-Kakes ....
1910	20	Seidl, München, Kleberzwieback ....
1913		Roman Uhl, Karlsbad, Carlsbad-Water Biscuits, "Sprudel" Brand ....
1913		G. Van Abbott & Sons, London, Caraway Biscuits for Diabetics ....
1913		" " " Diabetic Rusks for Diabetics ....
1913		" " " Euthenia Biscuits ....
1913		" " " Gluten Biscottes or Rolls ....
1913		" " " Gluten Bread or Slices ....
1913		G. Van Abbott & Sons, London, Gluten Butter Biscuits for Diabetics..
1913		" " " Ginger Biscuits for Diabetics ....
1913		" " " Midolia Biscuits ....
1913		" " " Walnut Biscuits for Diabetics ....
		BREAKFAST FOODS.
1913		Brusson Jeune, Villemur, France, Farine au Gluten ....
1910	13	" " " " Gluten Semolina ....
1913		Farwell & Rhines, Watertown, N. Y., Barley Crystals ....
1913		" " " " Cresco Grits ....
1908	37	Hazard's Wheat Protein Breakfast Food ....
1913		Health Food Co., New York, Manana ....
1913		Jireh Diabetic Food Co., New York, Whole Wheat Farina ....
1913		" " " " Frumenty ....
1911	14	The Kellogg Food Co., Battle Creek, Mich., Granola ....
1904	39	Pure Gluten Food Co., New York, Gum Gluten Breakfast Food ....
1906	8	" " " " " " " " ....
1911	14	" " " " " " " " ....
1911	14	" " " " " " Granules ....
1901	36	" " " " Pure Gluten Breakfast Cereal ......

OF DIABETIC FOODS.—*Continued.*

No. of Pieces.	Net weight of package.	Cost per package.	Cost per pound.	Water.	Ash.	Protein (Nx6.25).	Fiber.	Nitrogen free Extract.	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
	gms.	cts.	cts.	%	%	%	%	%	%	%	gms.	
14	110	...	...	...	..	16.4	..	37.6	...	....	14	...
..	....	...	...	9.4	2.2	25 2	51.3		11.9	47.0	10+	413
..	....	...	...	1 9	2.7	34.8	..	39.1	21.5	9.0	14	489
..	....	...	...	6 9	2 2	11.2	50.5		29.3	....	10+	511
8	49	35	324	6 7	3.8	9.3	0.1	46.4	33.7	38.0	11	524
10	96	...	...	...	..	17.5	..	58.4	...	....	9	...
..	....	...	...	4 9	1.3	19.9	63.1		10.8	....	8+	429
11	108	...	...	6 3	..	14.8	..	66 6	7 8	....	8	396
8	170	30	80	8 1	1.7	10 0	0.2	74 8	5.2	55.6	7	386
36	330	72	100	6.7	3 6	35 6	0.7	15.9	37 5	8.6	33	544
14 slices	60	48	363	10.8	1.2	70.9	0.3	·16.0	0.8	12 6	33	355
13	256	84	149	5 5	3.4	35.8	1.4	13.2	40.7	6.9	40	562
12	251	72	130	10.5	2.4	51.6	0.2	33.0	2.3	29.8	16	359
12 Mostly broken slices	216	72	151	10 6	2.0	54.1	0.2	30.9	2.2	27.4	17	361
	195	60	140	6.1	3 0	44.1	0.9	12.7	33.2	9.0	40	526
31	423	72	77	4 1	3 4	34 6	1.8	16 7	39.4	10.9	32	560
52	517	36	32	6 0	4 3	17 6	4 1	31 6	36 4	13 4	16	524
29	223	60	122	4 4	2 9	20 9	2.3	12.3	57.2	Trace	41	648
..	246	25	46	10 9	0.6	33 9	0 2	53.8	0.6	48 8	10	356
..	209	30	65	9 7	0 7	17 2	0 3	71 6	0.5	64.9	7	360
..	904	25	13	9 9	1 2	11 5	0 9	75 2	1 3	62.7	7	359
..	898	25	13	11 1	0 6	17.8	0 5	68.6	1.4	54.1	8	358
..	....	...	...	8 5	0 7	40 1	49 7		1.0	....	13+	368
..	188	25	60	10 2	2 4	37 6	1 1	46 8	1.9	31 0	11	355
..	703	15	10	6 2	1 8	12.9	2 2	74 6	2.3	59 5	7	371
..	674	15	10	6 2	1.4	12 3	1.1	77.3	1.7	65 4	7	374
..	370	10	12	6 1	2 3	13 9	0 6	76 3	0 8	45.2	7	368
..	....	...	...	9 5	0.9	54 4	0 5	33.9	0 8	30.4	16	360
..	....	...	...	9 1	1 1	53 4	0 3	34 5	1 6	*31.0	15	366
..	465	20	20	7 5	1 2	37 8	0 4	51.8	1.3	37.9	10	370
..	457	20	20	7 5	1 5	45.5	0 3	43 6	1.6	32.3	12	371
..	....	...	...	9 3	0 7	43 7	0 3	44 4	1.6	....	12	367

* Determined by the diastase method, without previous washing with water, and calculated as starch.

TABLE I.—ANALYSES

Date of Analysis		Manufacturer and Brand.
		MACARONI, NOODLES, ETC.
1910	13	Brusson Jeune, Villemur, France, Pâtes aux Oeufs Macaroni ....
1910	13	" " " " " " " Nouillettes ....
1913		" " " " Petites Pâtes au Gluten ....
1910	13	" " " " Vermicelle au Gluten ....
1913		Jireh Diabetic Food Co., New York, Macaroni ....
1913		Eugene Loeb, New York, Home Made Noodles ....
1906	9	Pure Gluten Food Co., New York, Gum Gluten Macaroni ....
1911	14	" " " " " " Noodles ....
1901	5	The Marvelli Co., Detroit, Mich., Macaroni ....
1912	18	" " " " " Spaghetti ....
		PEANUT BUTTER.
1899	4	Atlantic Peanut Refinery, Philadelphia ....
1913		J. W. Beardsley's Sons, New York, Acme Red Brand ....
1913		Beech-Nut Packing Co., Canajoharie, N. Y. ....
1913		A. C. Blenner & Co., New Haven (Distributed by) ....
1913		D. W. Brooke, Newark, N. J. ....
1913		Dillon & Douglass, New Haven (Distributed by), Perfection ....
1913		H. J. Heinz Co., Pittsburgh, Pa. ....
1913		The Kellogg Food Co., Battle Creek, Mich. ....
1913		" " " " " ....
1913		Francis H. Leggett & Co., New York, Premier ....
1913		MacLaren Imperial Cheese Co., Detroit, Mich., Eagle ....
1913		Nut Products Co., New Haven, Penolia ....
1899	4	Peanolia Food Co., New Haven, Peanolia ....
1913		S. S. Pierce Co., Boston, Acharis Brand ....
		Average...........
		ALMOND PASTE.
1902–3	3	Chapman, Chicago ....
1902–3	3	Henry Heide, New York ....
1902–3	3	Spencer, New York ....
		Average...........
		NUTS.
1913		California Paper Shell Almonds, edible portion (Sold by Chas. Lawrence Co, Boston) ....
1913		Jireh Diabetic Food Co., New York, Diatetic Pine Nuts (Pignolias) ...
1913		The Kellogg Food Co, Battle Creek, Mich, Pine Nuts ....
		MALTED NUTS.
1901	36	The Kellogg Food Co., Battle Creek, Mich., Malted Nuts ....
1913		Nashville Sanitarium-Food Co., Nashville, Tenn., Malted Nut Food....

OF DIABETIC FOODS.—*Continued.*

No. of Pieces.	Net weight of package.	Cost per package.	Cost per pound.	Water.	Ash.	Protein (Nx6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread	Calculated Calories per 100 gms.
	gms.	cts.	cts.	%	%	%	%	%	%	%	gms.	
..	220	45	93	8.8	0.7	13.9	Tr.	76.2	0.4	69.2	7	364
..	231	30	59	8.7	0.7	14.4	Tr.	75.7	0.5	68.9	7	365
..	259	25	44	9.0	0.8	18.6	0.2	70.4	1.0	61.2	8	365
..	449	45	45	8.0	0.8	18.4	Tr.	72.4	0.4	65.8	7	367
..	437	25	26	8.8	1.1	16.9	0.9	71.4	0.9	58.8	7	361
..	130	20	70	9.8	1.0	41.8	0.2	41.7	5.5	36.7	13	384
..	....	...	...	10.3	0.7	41.4	0.3	46.3	1.0	*46.2	11	360
..	118	15	58	8.3	1.1	36.6	0.2	51.4	2.4	42.0	10	374
..	....	...	...	13.4	0.5	20.7	64.8		0.6	....	8+	347
..	....	...	...	...	..	15.5	..	...	...	....	...	...
..	....	25	50	2.1	4.0	28.7	2.3	16.5	46.4	6.2	32	598
..	416	25	27	2.2	4.4	28.2	1.7	15.2	48.3	4.0	35	608
..	109	10	42	2.0	3.5	29.4	1.9	16.6	46.6	4.5	32	613
..	126	10	36	2.9	4.0	29.7	1.2	14.3	47.9	4.6	37	607
..	171	10	27	1.8	3.8	29.5	1.5	14.9	48.5	4.3	36	614
..	666	23	16	1.8	4.4	29.1	1.8	20.1	42.8	4.8	26	582
..	90	10	50	3.0	3.9	28.9	1.7	15.2	47.3	4.0	35	592
..	92	15	74	3.6	3.3	30.6	1.5	12.2	48.8	3.2	43	610
..	311	30	44	3.1	3.0	28.1	1.4	14.7	49.7	3.4	36	619
..	469	23	22	2.1	4.0	29.7	1.7	18.8	43.7	6.5	28	587
..	199	10	23	1.5	3.8	32.1	1.7	16.0	44.9	4.3	33	597
..	218	13	27	2.4	3.9	27.9	1.5	13.0	51.3	3.9	41	625
..	....	25	50	2.0	6.0	29.9	2.1	13.3	46.7	5.6	40	593
..	231	25	49	1.7	3.7	28.7	3.0	14.6	48.3	5.1	19	608
..	....	...	...	*2.3*	*4.0*	*29.3*	*1.8*	*15.4*	*47.2*	*4.6*	*34*	*604*
..	....	...	...	23.7	1.4	13.1	36.3		25.5	11.3	15+	427
..	....	...	...	22.0	1.6	12.7	43.7		20.0	small	12+	406
..	....	...	...	27.0	1.7	13.5	31.6		26.2	very small	17+	416
..	....	...	...	*24.2*	*1.6*	*13.1*	*37.2*		*23.9*	....	*15+*	*416*
..	177	13	35	3.5	3.5	18.4	3.0	16.3	55.3			
										0	33	637
..	242	40	75	2.0	4.6	39.7	0.9	3.4	49.4			
..	451	75	75	2.6	4.5	38.0	1.1	4.2	49.6	0	156	617
										....	126	615
..	....	...	...	2.6	2.2	23.7	43.9		27.6	....	12+	519
..	....	...	25	3.4	1.7	24.7	27.5		42.7	3.4	19	593

* Determined by the diastase method, without previous washing with water, and calculated as starch.

TABLE I.—ANALYSES

Date of Analysis.		Manufacturer and Brand.
		OTHER NUT PREPARATIONS.
1906	8	The Kellogg Food Co., Battle Creek, Mich., Almond Butter (Sanitas) ..
1908	37	" " " " " " " ..
1913		" " " " Nut Bromose (Meltose and Nuts) ....
1906	8	" " " " Nut Butter (Sanitas) ....
1906	8	" " " " Nut Meal " ....
1906	8	" " " " Nuttolene " ....
1906	8	" " " " Protose " ....
1913		Nashville Sanitarium-Food Co., Nashville, Tenn., Nut Butter ....
1913		" " " Nutcysa ....
1913		" " " Nutfoda ....
		CHOCOLATE.
1913		Brusson Jeune, Villemur, France, Chocolat with Added Gluten à la Vanille ....
1913		Fromm & Co., Dresden, Conglutin-Diabetiker-Schokolade ....
1910	34	Groetzsch, Frankfurt, Esschokolade (Orange) ....
1910	34	" " Kochschokolade ....
1901	40	Plasmon Co., London, Plasmon Chocolate ....
1903	6	" " " " ....
1910	20	Rademann's Nährmittelfabrik, Frankfurt, Diabetiker-Chokolade ......
1913		" " " " " ......
1898	32	Troponwerke, Mülheim, Tropon-Chokolade ....
1899	33	" " " " ....
		COCOA.
1913		Charrasse Gluto-Cacao ....
1906	8	Jireh Diabetic Food Co., New York, Diabetic Cocoa ....
1906	8	" " " " " " ....
1903	6	Plasmon Co., London, Plasmon Cocoa ....
1913		Rademann's Nährmittelfabrik, Frankfurt, Diabetiker-Cacao ....
1913		Callard, Stewart & Watt, London, Casoid Chocolate Almonds ....
		MISCELLANEOUS PRODUCTS.
1913		Gustav Muller & Co., New York, Dr. Bouma Sugar-Free Fat-Milk ....
1900	42	Rose's Diabetesmilch, 5% ....
1900	42	" " 10% ....
1913		D. Whiting & Sons, Boston, Sugar-Free Milk (ave. 3 analyses) ....
1913		Health Food Co., New York, Kaffeebrod ....
1911	15	The Kellogg Food Co., Battle Creek, Mich., Sanitas Meltose ....

OF DIABETIC FOODS.—*Continued.*

No. of Pieces.	Net weight of package.	Cost per package.	Cost per pound.	Water.	Ash.	Protein (Nx6.25). (See page 15.)	Fiber.	Nitrogen-free Extract. (See page 15.)	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
	gms.	cts.	cts.	%	%	%	%	%	%	%	gms.	
..	....	...	...	0.9	2.9	22.6	3.9	8.2	61.5	*3.7	65	677
..	....	...	...	2.3	3.0	21.7	11.5		61.5	....	46+	686
..	221	30	61	14.0	1.5	17.1	1.2	39.4	26.8	3.2	13	467
..	....	...	...	0.2	2.9	28.8	3.7	13.9	50.5	*9.1	38	625
..	....	...	...	3.0	2.2	29.0	2.0	12.1	51.7	*8.9	44	630
..	....	...	...	55.2	2.2	12.7	1.8	6.3	21.8	....	84	272
..	....	...	...	62.2	1.5	22.6	0.9	3.6	9.2	....	147	188
..	473	17	16	1.9	2.9	28.0	1.6	13.0	52.6	3.8	41	637
..	411	15	17	57.0	1.8	12.9	1.0	6.3	21.0	Trace	84	266
..	440	15	15	62.3	1.6	20.8	0.5	6.8	8.0	Trace	78	182
..	250	90	163	2.6	3.2	15.9	2.2	26.4	49.7	9.2	20	617
..	96	40	189	4.0	5.4	17.6	1.2	32.7	39.1	4.3	16	553
..	....	...	...	4.6	2.3	10.8	4.4	17.2	60.7	12.0	31	658
..	....	...	...	10.9	6.7	25.3	5.9	26.1	25.1	15.9	20	432
..	....	...	...	...	..	21.1	..	...	...	....	?	...
..	....	...	...	3.5	2.5	20.2	0.7	48.0	25.1	Trace	11	499
..	....	...	...	...	..	16.1	..	9.6	...	....	55	...
..	99	45	206	2.5	3.2	17.5	2.3	16.9	57.6	3.8	31	656
..	....	...	...	1.7	1.6	18.2	2.7	49.9	25.9	....	11	506
..	....	...	...	1.8	..	18.4	..	...	...	....	?	...
..	....	...	...	6.4	6.7	21.5	3.1	40.1	22.2	16.3	13	446
..	....	...	...	3.1	4.3	20.6	3.6	50.6	17.8	*32.6	10	445
..	....	...	...	7.3	3.9	19.1	3.4	47.9	18.4	*29.0	11	434
..	....	...	...	8.9	6.6	52.8	20.9		10.8	5.1	25+	392
..	258	80	141	5.2	5.9	17.6	3.0	44.7	23.6	10.7	12	462
..	107	50	212	3.5	3.1	22.3	3.2	16.1	51.8	Trace	33	620
	(14.5 oz.)	30	...	91.8	0.5	2.4	..	...	5.3	....	...	57
..	....	...	...	92.5	0.2	1.1	..	1.2	5.0	....	442	54
..	....	...	...	86.3	0.2	2.3	..	1.2	10.0	....	442	104
	(8 oz.)	25	...	86.4	0.7	5.7	..	Tr.	7.2	....	...	88
..	351	15	19	4.5	2.2	12.9	6.4	72.5	1.5	10.1	7	355
..	....	...	...	26.8	0.5	0.6	72.1		...	....	7	291

* Determined by the diastase method, without previous washing with water, and calculated as starch.

TABLE XIIIa:—

Station No.	Manufacturer and Brand
3265	Waukesha Health Products Co., Waukesha, Wis. Hepco Dodgers ....
3200	" " " " " Hepco Flour for Diabetics
3309	Loeb's Diabetic Food Bakery, New York. Gluten Luft Bread ....
3310	" " " " " P. and L. Genuine Gluten Bread.
3312	"Sanity," Prag. Aleuronat-zwieback für Diabetiker ....
3311	" " Bretzels ....
3313	" " Conglutin Mandelzwieback für Diabetiker ....
3325	" " Diabetiker-Bisquits ohne Mehl und ohne Zucker ....
3314	" " Diabetiker-Cakes ....
3317	" " Echte Delikatess-Salzstangen für Diabetiker ....
3322	" " Echtes Mandelgebäck für Diabetiker ....
3315	" " Haferzwieback (ungesüsst) für Zucker- u. Magenkranke
3306	" " Karlsbader Curzwieback für Diabetiker, etc. ....
3307	" " Pokorny's Echter Diabetiker Zwieback, ohne Mehl und ohne Zucker ....
3308	" " Saccharin-Oblaten ohne Zucker ....
3316	Brah-Ma (mfr. name not given). Sent by Eugene Loeb, New York ......
3320	"Sanity," Prag. Diabetiker Mandel-, Nuss- und Schokolade Bonbons .....
3324	" " Laevulose Schokolade ....
3323	" " Mendel- u. Nussschokolade mit Laevulose für Diabetiker.
3326	" " Manit-Chocolate ....
3486	Pure Gluten Food Co., New York. Hoyt's Gum Gluten Dainty Fluffs No. 1
3487	" " " " " Hoyt's Gum Gluten Flour, Ground ....

DIABETIC FOODS.

Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	Polarization at 20° C.*		Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
							Direct.	After Inversion.		
4.6	5.1	42.9	4.2	22.4	20.8	Trace.	....	...	26	441
8.5	1.1	34.1	0.2	47.4	8.7	Trace.	....	...	24	448
42.2	1.4	25.8	0.1	27.8	2.7	40.1	....	...	11	404
8.4	2.0	17.0	0.3	61.6	10.7	23.9	....	...	19	239
7.2	3.6	12.8	0.3	55.4	20.7	49.3	....	...	9	411
7.1	2.3	15.0	0.3	54.6	20.7	46.5	....	...	10	459
8.4	1.9	25.8	0.4	45.3	18.2	42.4	....	...	10	465
7.5	1.8	14.0	0.5	60.1	16.1	35.4	....	...	12	448
6.9	3.5	12.7	0.5	54.1	22.3	52.0	....	...	9	441
4.3	2.9	32.5	0.9	10.8	48.6	44.8	....	...	10	468
8.2	1.8	14.9	0.5	58.7	15.9	4.0	....	...	49	611
9.0	1.8	10.2	0.2	74.6	4.2	47.6	....	...	9	438
4.6	3.2	32.9	0.9	10.4	48.0	58.7	....	...	7	376
5.7	2.4	16.8	1.7	41.7	31.7	3.6	....	...	51	605
8.1	2.9	11.0	1.3	68.6	8.1	27.1	....	...	13	519
18.4	2.3	12.5	0.9	37.1†	28.8	55.2	....	...	8	391
4.0	3.0	11.4	2.6	35.6‡	43.4	Trace.	+10.2	+9.4	14	458
3.1	2.6	12.0	2.2	26.2§	53.9	6.2	—5.0	—5.0	15	579
4.2	2.5	10.0	1.7	37.9¶	43.7	4.3	—3.0	—4.0	20	638
7.2	0.9	86.0	0.3	5.0	0.6	4.8	—6.4	—6.6	14	585
8.5	1.0	41.4	0.3	47.4	1.4	5.0	....	...	106	369
6.9	5.4	41.6	4.1	20.7	21.3	40.4	....	...	11	368

* 6.5 gms. to 100 cc., read in 200 mm. tube. † 18.60% total sugars as dextrose. ‡ 17.55% total sugars as invert. § 14.31% total sugars as invert. ¶ 21.32% total sugars as invert.

TABLE IV:—

Station No.	Manufacturer and Brand.
	The Dieto Food Co., New York City.
5169	Dieto Baking Powder ....
5168	" Barley Coffee ....
5175	" Bread, Pure Whole Wheat ....
5171	" Cocoa ....
5166	" Crackers ....
5174	" Flour, Pure Whole Wheat ....
5167	" Nut Cereal ....
5170	" Pine Nuts ....
5173	" Rusks ....
5165	" Wheat and Barley Cereal ....
5172	" Whole Wheat Brand Macaroni ....
	Fromm & Co., Dresden.
3502	Conglutin Drops ....
3503	Conglutin-Zwieback ....
	Karl Goldscheider, Karlsbad.
3500	Aleuronat-Conglutin Cakes ....
3499	Butter-Brezeln ....
3506	Feinste Cocosnuss-Biskuits für Diabetiker. "3.6% carbohydrates." .....
3507	Feinste Vanille-Biskuits für Diabetiker. " " .....
3505	Hönigküchen für Diabetiker. " " .....
3498	Saccharin-Oblaten ohne Zucker ....
3501	Tee Gebäck ....
3493	Zwieback ....
3497	Feinste Dessert-Schokolade für Diabetiker. "9.98% carbohydrates."...
3494	Feinste Mocca-Schokolade für Diabetiker. "10.26% carbohydrates."...
3495	Feinste Nuss-Schokolade für Diabetiker. "11.32% carbohydrates.".....
3496	Feinste Orange-Schokolade für Diabetiker. "9.98% carbohydrates."....
	The Health Food Co., New York City.
5365	Almond Meal ....
5376	Alpha Best Diabetic Wafer ....
5372	Diabetic Biscuit ....
5361	Gluten Flour No. 1 ....
5373	Gluten Nuggets ....
5358	Glutosac Bread ....
5370	" Butter Wafers ....
5362	" Gluten Flour ....
5367	" Rusks ....
5369	" Wafers, Plain ....
5371	" Zwieback ....
5366	Manana Gluten Breakfast Food ....
5356	No. 1 Proto Puffs ....
5357	No. 2 Proto Puffs ....
5359	Protosac Bread ....
5363	" Gluten Flour ....

DIABETIC FOODS.

No. of Pieces.	Net Weight of Package.	Cost per Package.	Cost per Pound.	Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
	oz.	cts.	cts.									
..	8.1	35	70	....	...	...	...	....	....	12.94	.....	...
..	14.0	30	34	3.42	3.08	13.19	9.14	63.87	7.30	17.72	8	374
1	15.1	12	13	40.42	1.69	9.67	0.71	47.15	0.36	36.57	11	231
..	7.3	30	66	4.29	5.40	23.56	4.87	¶38.95	22.93	12.38	14	456
42	10.4	30	46	6.59	1.75	13.38	0.98	68.06	9.24	54.84	8	409
..	79.0	60	12	7.85	1.15	14.75	1.01	73.13	2.11	62.44	7	371
..	14.3	30	34	5.00	1.95	21.63	1.22	51.82	18.38	39.54	10	459
..	7.9	40	81	2.23	4.55	39.69	0.75	2.76	50.02	0.00	193	620
47	12.7	60	76	6.43	1.50	15.94	0.98	66.04	9.11	52.09	8	410
..	36.3	30	13	6.77	1.68	11.63	2.00	75.77	2.15	61.42	7	359
..	13.4	30	36	9.81	0.90	13.88	0.57	73.70	1.14	58.72	7	361
..	...	..	..	6.49	5.23	50.81	0.23	36.13	1.11	29.19	15	358
..	...	..	..	4.48	2.00	14.25	0.40	57.62	21.25	29.70	9	479
..	...	..	..	5.17	1.25	26.63	0.08	51.30	15.57	31.67	10	452
..	...	..	..	5.16	1.83	10.50	0.08	67.57	14.86	43.93	8	446
..	...	..	..	2.71	2.73	34.44	0.88	13.86	‡45.38	None	38 (?)	...
..	...	..	..	3.14	2.85	46.38	0.55	16.75	‡30.33	None	32 (?)	...
..	...	..	..	2.98	3.05	40.31	1.00	13.91	‡38.75	None	38 (?)	...
..	...	..	..	5.42	2.43	16.50	1.95	51.10	22.60	33.47	10	474
..	...	..	..	3.44	1.28	7.00	0.23	60.79	27.26	18.00	9	517
..	...	..	..	6.85	2.70	21.31	0.23	65.30	3.61	51.69	8	379
..	...	..	..	2.17	1.80	11.38	1.68	†25.42	57.55	4.98	21	665
..	...	..	..	2.20	2.25	10.19	1.65	†23.49	60.22	4.11	23	677
..	...	..	..	3.37	2.65	14.63	1.70	†23.30	54.35	6.86	23	641
..	...	..	..	2.38	2.20	11.44	1.43	†24.91	57.64	4.98	21	664
..	...	..	100	7.16	5.48	49.13	0.48	15.91	21.84	0.00	33	457
23	3.6	50	222	7.61	5.03	67.06	0.16	11.73	8.41	1.26	45	391
26	9.6	25	42	5.80	2.55	35.94	0.35	46.53	8.83	39.77	11	409
..	...	..	60	7.65	2.78	75.69	0.21	12.79	0.88	7.09	41	362
..	11.9	35	47	5.32	2.75	31.69	0.27	45.67	14.30	34.93	12	438
1	10.4	15	23	37.20	1.64	27.16	0.82	31.08	2.10	22.17	17	252
24	8.8	30	55	5.44	2.10	31.13	0.38	47.01	13.94	38.93	11	438
..	32.3	37	18	8.18	1.20	38.00	0.48	50.45	1.69	41.96	10	369
14	3.9	15	62	6.66	2.50	39.31	1.13	46.96	3.44	33.64	11	376
100	6.0	15	40	7.24	2.55	42.63	1.58	44.26	1.74	29.55	12	363
22	6.4	20	50	5.92	2.50	36.38	0.85	46.64	7.71	32.46	11	401
..	10.1	25	40	7.56	2.53	42.63	1.73	43.56	1.99	29.87	12	363
8	4.4	35	127	8.71	2.80	72.25	0.40	13.02	2.82	9.23	40	366
8	5.3	25	75	9.16	2.60	58.75	0.40	27.00	2.09	20.70	20	362
1	9.8	20	33	30.70	2.11	29.82	0.38	35.19	1.80	27.66	12	276
..	30.2	40	21	8.16	1.30	45.94	0.38	42.26	1.96	31.50	13	370

Station No.	Manufacturer and Brand.
5368	Protosac Rusks
5375	Protosoy Diabetic Wafers
5364	" Soy Flour
5360	Pure Washed Gluten
5374	Salvia Almond Sticks
	Ch. Heudebert, Paris.
4379	*Pain d'Aleurone pour Diabétiques. "5% carbohydrates."
4377	*Pain "Essentiel" en Biscottes
4378	*Pain de Gluten pour Diabétiques
	J. Heinbockel & Co., Baltimore, Md.
5249	Diabeto Bread for Diabetes
	Loeb's Diabetic Food Bakery, New York City.
5389	Chocolate Almond Bars
5387	Diabetic Almond Macaroons
5388	" Bread Sticks
5390	" Chocolates
5385	" Lady Fingers
5386	" Sponge Cookies
5391	Gluten Luft Bread
5392	P. & L. Genuine Glubetic Bread
	Mansfield Laboratories, Mansfield, Mass.
4374	No Name (square)
4375	No Name (hexagonal)
	The Pure Gluten Food Co., New York City.
5379	Hoyt's Gum Gluten Biscuit Crisps
5397	" " " Breakfast Food
5399	" " " Flour, 50%
5398	" " " " Ground
5394	" " " Granules
5393	" " " Noodles
5396	" " " Self Raising Flour
5395	" " " Special Flour
5377	No. 1 Dainty Fluffs
5378	No. 2 " "
	Battle Creek Sanitarium Co., Battle Creek, Mich.
5400	80% Gluten Meal
	Phospho Food Co., Los Angeles, Cal.
5555	Phospho D. & D. Special

* Sold by A. Beauvais & Co., New York City, and John Gilbert & Son, New Haven.

OF DIABETIC FOODS.—*Continued.*

No. of Pieces.	Net Weight of Package.	Cost per Package.	Cost per Pound.	Water.	Ash.	Protein (N x 6.25).	Fiber.	Nitrogen-free Extract.	Fat (Ether Extract).	Starch.	Weight supplying same amount carbohydrates as 10 gms. wheat bread.	Calculated Calories per 100 gms.
	oz.	cts.	cts.									
10	3.0	15	80	7.21	2.93	39.69	0.48	46.69	3.00	35.89	11	373
29	5.7	40	112	4.76	3.50	37.07	1.80	29.34	23.53	14.40	18	477
..	...	..	50	3.86	5.30	42.88	2.75	26.03	19.18	1.86	20	448
..	...	..	25	7.03	0.58	85.63	0.40	5.35	1.01	2.81	99	373
77	15.6	75	77	2.63	3.38	22.31	0.70	41.04	29.94	28.29	13	523
60	10.2	90	141	8.18	4.43	76.06	0.71	9.17	1.45	4.22	58	354
50	16.6	80	77	7.67	2.33	26.38	0.20	62.22	1.20	49.89	8	365
21	14.3	110	123	7.85	3.96	80.65	0.16	6.54	0.84	3.38	81	356
..	...	..	..	33.47	3.22	8.55	1.15	52.12	1.49	40.39	10	256
4	2.6	25	154	2.88	3.77	16.25	4.32	**31.78	41.00	5.74	17	561
49	4.4	40	145	3.22	2.98	46.50	1.53	8.00	37.77	0.64	66	558
10	2.9	15	83	8.72	2.28	50.44	0.60	34.52	3.44	24.64	15	371
4	2.6	25	154	1.98	3.85	14.88	4.90	**22.97	51.42	6.92	23	614
25	1.4	25	286	6.01	2.75	56.56	0.35	6.04	28.29	1.81	88	505
32	1.6	25	250	6.92	2.75	54.69	0.55	4.98	30.11	1.24	106	510
12	14.4	85	94	5.68	2.05	52.38	0.63	26.02	13.24	22.89	20	433
1	11.9	15	20	30.07	1.06	38.77	0.36	25.69	4.05	19.15	21	294
..	...	..	..	9.34	5.53	29.50	0.43	47.79	7.41	§34.26	11	376
..	...	..	..	8.65	4.84	25.38	0.47	45.49	15.17	§31.16	12	358
20	3.8	25	105	5.97	1.70	52.69	1.08	38.04	0.52	31.22	14	368
..	16.5	20	19	6.48	0.60	45.38	0.28	46.40	0.86	39.21	11	375
..	...	..	..	6.61	0.70	49.69	0.33	41.52	1.15	37.07	13	375
..	16.0	18	18	8.21	0.60	41.94	0.18	48.14	0.93	42.61	11	369
..	16.5	20	19	6.64	0.73	42.69	0.45	48.80	0.69	41.93	11	372
..	4.0	15	60	8.21	0.65	40.50	0.33	49.08	1.23	41.82	11	369
..	16.1	18	18	7.30	3.88	42.69	0.40	44.98	0.75	38.98	12	357
..	16.3	30	29	5.63	0.93	90.69	0.35	1.68	0.72	2.17	315	376
19	2.6	40	246	7.04	0.75	79.94	0.45	11.28	0.54	10.74	47	370
18	2.4	25	167	7.45	0.68	66.25	0.28	24.87	0.47	21.85	21	369
..	14.4	..	..	6.83	...	84.00	...	....	....	5.77	..	...
..	...	..	..	8.74	1.22	13.69	1.24	72.92	2.19	58.57	7	366

† 3497 contains 10.95% as invert sugar, 3494, 10%, 3495, 7.25%, and 3496 11.15%. ‡ In part glyceral. § Possibly in part due to the copper-reducing power of the agar-agar present. ¶ Polarization at 20° C. direct + 1.5°, after inversion ± 0.0°. ** Polarization at 20° C. direct + 2.1°, after inversion ± 0.0.

Material.	Manufacturer.
Flour and Meal.	
Barker's Gluten Food, A	Herman Barker, Somerville, Mass.
Barker's Gluten Food, B	" " " "
Barker's Gluten Food, C	" " " "
40 per cent. Gluten Flour	Battle Creek Sanatarium Food Co.
40 per cent. Gluten	" " " " "
Gluten Flour	Farwell & Rhines, Watertown, N. Y.
Gluten Flour	" " " "
Cresco Flour	" " " "
Special Diabetic Food (Flour)	" " " "
Special Diabetic Food (Flour)	" " " "
Special Diabetic Food (Flour)	" " " "
Glutosac Flour, 35 per cent. Proteids	The Health Food Co., New York
Protosac Flour, 40 per cent. Proteids	" " " " "
Pure Washed Gluten Flour, 85 per cent. Proteids, 6 per cent. Carbohydrates, 9 per cent. Water	" " " " "
Jireh Diabetic Flour	Jireh Diabetic Food Co., New York
Wheat and Barley	" " " " "
Wheat and Barley	" " " " "
Flour	" " " " "
Educator Standard Gluten Flour	Johnson Educator Food Co,, Boston
Almond Meal	The Health Food Co., New York
Vegetable Gluten, 20 per cent. Starch	Theo. Metcalf Co., Boston
Sojah Bean Meal, 5.5 per cent. Starch.	" " " "
Soja Bean Meal, 7.63 per cent. Starch.	" " " "
Hoyt's Gum Gluten	The Pure Gluten Food Co., New York
Gum Gluten, Ground	" " " " " "
Gum Gluten, Self-raising	" " " " " "
Gum Gluten Breakfast Food	" " " " " "
Sanitas Nut Meal	Sanitas Nut Food Co., Ltd., Battle Creek, Mich.
Casoid Flour	Callard, Stewart & Watt, Ltd., London
Bread, Biscuit, Rusk, etc.	
40 per cent. Gluten Biscuit	Battle Creek Sanatarium Food Co.
Potato Gluten Biscuit	" " " " "
Pure Gluten Biscuit	" " " " "
No. 1 Proto Puffs, 78.86 per cent. Protein, 6.71 Starch	The Health Food Co., New York
Salvia Sticks	" " " " "
Protosac Bread, 40 per cent. Protein	" " " " "
Glutosac Bread, 35 per cent. Proteids	" " " " "
Plain Glutosac Wafers, 33 per cent. Proteids	" " " " "
Glutona, 35 per cent. Proteids	" " " " "
Glutosac Zweiback, 35 per cent. Proteids	" " " " "
Glutosac Butter Wafers, 35 per cent. Proteids	" " " " "
Protosac Rusks, 40 per cent. Proteids	" " " " "
Glutosac Rusk, 35 per cent. Proteids	" " " " "
Diabetic Biscuit, 40 per cent. Proteids.	" " " " "
Jireh Whole Wheat Bread	Jireh Diabetic Food Co., New York
Jireh Diabetic Biscuit	" " " " "
Jireh Diabetic Biscuit	" " " " "
Jireh Wheat Nuts	" " " " "
Jireh Wheat Nuts	" " " " "
Jireh Diabetic Rusks	" " " " "
Dr. Johnson's Gluten Wafers	Johnson Educator Food Co., Boston
Dr. Johnson's Diabetic Biscuit	" " " " "
Dr. Johnson's Almond Biscuit	" " " " "
Dr. Johnson's Educator Crackers, Greseni Gluten	" " " " "
Dr. Johnson's Glutine. Greseni Gluten.	" " " " "
Dr. Johnson's Gluten Rusk, Greseni Gluten	" " " " "
Casoid Biscuits	Callard, Stewart & Watt, Ltd., London
Paste, etc.	
Sanitas Nut Butter	Sanitas Nut Food Co., Ltd., New York
Sanitas Nutto'ene	" " " " " "
Sanitas Almond Butter	" " " " " "
Sanitas Protose	" " " " " "

Analysis of material as purchased.							Analysis calculated to water-free basis.					
Water.	Ash.	Protein, (nitrogen x 6¼).	Fiber.	Nitrogen-free extract.	Fat.	Starch, sugar, and dextrin.*	Ash.	Protein (nitrogen x 6¼).	Fiber.	Nitrogen-free extract.	Fat.	Starch, sugar, and dextrin.*
per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.	per ct.
10.12	0.22	85.38	0.03	3.69	0.56	4.46	0.24	95.00	0.03	4.11	0.62	4.96
10.14	0.22	84.38	0.02	4.64	0.60	6.03	0.24	93.90	0.02	5.18	0.66	6.71
9.71	0.22	82.50	0.04	6.72	0.81	8.33	0.24	91.49	0.04	7.44	0.89	9.23
10.49	0.51	40.25	0.15	47.42	1.18	46.85	0.57	44.97	0.16	52.98	1 32	52.35
8.53	1.38	38.44	0.11	50.33	1.21	50.01	1.51	42.04	0.12	55.01	1.32	44.68
12.67	0.43	11.37	0.25	74.38	0.90	71.51	0.49	13.02	0.2[illegible]	85.18	1.03	81.90
13.32	0.46	10.75	0.14	74.38	0.95	72.02	0.50	12.40	0.16	85.78	1.16	83.10
12.74	0.48	11.12	0.05	74.73	0.88	. .	0.55	12.75	0.05	85.57	1.08	
12.02	1.93	14.25	1.37	67.47	2.96	58.33	2.19	16.20	1.55	76.70	3.36	66 30
10.27	1 60	14.20	1.07	70.11	2.75	62.11	1.78	15.83	1.19	78.14	3.06	69.23
12.39	1.28	12.75	0.62	70.35	2.61	. .	1.46	14.55	0.70	80.31	2.98	
10.13	1.14	34.06	0.97	52.13	1.57	49.33	1.27	37.90	1.08	58.00	1.75	54.88
10.58	0.66	36.62	0.25	51.03	0.86	49.98	0.73	40.95	0.27	57.09	0.96	55.90
6.22	0.80	62.40	0.16	29.51	0.91	27.51	0.85	66.54	0.17	31.47	0.97	29.33
9.26	1.30	14.25	1.03	71.95	2.21	66.63	1.43	15.71	1.13	79.30	2.43	73.44
9.72	1.51	11.75	1.59	73.56	1.87	66.22	1.67	13.02	1.76	81.48	2.07	73.36
9.54	1.64	11.25	1.38	74.39	1.80	. .	1.81	12.44	1.52	82.24	1.99	
10.28	1 32	12.12	1.11	72.63	1.84	. .	1.48	13.62	1.25	81.58	2.07	
11.26	0.95	26.37	0.37	59.38	1.67	56.84	1.07	29.72	0.41	66.92	1.88	64.06
8.51	6.42	50.62	2.86	15.96	15.63	7.18	7.02	55.32	3.12	17.45	17.09	7.85
7.88	0.65	61.37	0.32	28.23	1.55	26.79	0.70	66.64	0.34	30.64	1.68	29.09
7.75	4.38	39.87	3.85	25.09	19.06	8.95	4.75	43.22	4.17	27.20	20.66	9.70
. .	. .	36.75										
11.19	0.96	31.82	0.33	54.15	1.55	51.95	1.08	35.83	0.37	60.98	1.74	58.50
6.92	0 99	50.13	0.48	39.62	1.86	38.55	1.06	53.90	0.51	42.53	2.00	41.44
10.79	4.53	37.87	0.45	45.41	0.95	42.86	5.08	42.45	0.50	50.91	1.06	48.05
9.11	1.07	53.37	0.33	34.48	1.64	41.04	1.17	58.75	0.36	37.92	1.80	34.16
3.03	2.17	29.00	2.01	12.13	51.66	8.94	2.24	29.90	2.07	12.51	53.28	9.22
10.01	2.46	85.56	. .	. .	0.50	. .	2.73	95.08	. .	. . . .	0.56	
7.45	1.55	35.75	0.13	54.10	1.02	52.64	1.68	38.63	0.14	58.45	1.10	56.88
8.15	0.82	80.00	0.03	10.64	0.36	9.84	0.89	87.10	0.03	11.59	0.39	10.73
7.53	0.99	80.25	0.16	10.31	0.76	9.07	1.07	86.79	0.17	11.15	0.82	9.81
8.55	1.32	75.88	0.08	13.15	1.02	9.86	1.44	82.98	0.08	14.39	1.11	10.78
6.62	7.45	39.19	1.91	24.06	20.77	18.66	7.98	41.96	2.04	25.78	22.24	19.98
27.30	1.44	32.47	0.22	36.97	1.60	33.12	1.98	44.66	0.30	50.86	2.20	45.56
31.51	1.88	27.42	0.42	36.11	2.66	29.90	2.74	40.07	0.61	52.70	3.88	43.65
6.13	3.54	29.44	1.52	49.77	9.60	41.60	3.77	31.36	1.62	53.02	10.23	44.33
4.77	2.48	22.06	0.30	58.60	11.79	54.88	2.60	23.17	0.31	61.54	1[illegible].38	57.64
7.62	2.45	32.50	1.21	49.33	6.89	40.93	2.65	35.18	1.31	53.40	7.46	44.30
4.71	3.76	27.62	1.63	49.41	12.87	41.24	3.94	28.99	1.71	51.85	13.51	43.29
5.90	2.01	40.87	0.53	48.66	2.03	43.90	2.13	43.44	0.56	51.72	2.15	46.65
4.48	2.70	36.50	0.88	51.63	3.81	42.48	2.82	38.21	0.92	54.06	3.99	44.47
4.67	3.10	28.12	0.34	54.75	9.02	51.10	3.25	29.50	0.35	57.44	9.46	53.60
39.18	1.79	9.36	0.61	48.68	0.38	43.83	2.94	15.39	1.03	80.02	0.62	72.05
6.34	2.01	14.75	0.94	72.30	3.66	65.44	2.14	15.75	1.00	77.21	3.90	69.87
8.90	2.25	13.12	1.22	70.57	3.94	. .	2.47	14.41	1 34	77.46	4.32	
7.57	2.33	19.00	1.00	54.55	15.55	50.13	2.52	20.56	1.08	59.01	16.83	54.24
5.95	3.21	21.00	1.16	46.41	22.27	. .	4.41	22.33	1.23	49.35	23.68	
8.69	3.06	14.62	0.91	67.71	5.01	. .	3.35	16.02	0.99	74.15	5.49	
6.85	0.93	30.31	0.29	61.25	0.37	57.00	0.99	32.54	0.31	65.77	0.39	61.20
5.90	1.89	25.31	0.39	59.03	7.48	54.85	2.01	26.90	0.41	62.73	7.95	58.29
5.31	2.07	29.00	0.46	54.34	8.82	50.00	2.18	30.63	0.48	57.40	9.31	52.82
6.15	2.94	23.00	0.21	63.09	4.61	57.86	3.13	24.51	0.22	67.23	4.91	61.65
6.37	2.58	21.87	0.56	67.86	0.76	63.05	2.75	23.36	0.[illegible]9	72.49	0.81	67.84
6.23	2.98	22.12	0.33	68.06	0.28	63.27	3.18	23.59	0.35	72.59	0.29	67.47
7.82	3.92	63.00	. .	. .	17.34	8.07	4.25	68.35	. .	. . . .	18.81	8.76
0.17	2.85	28.81	3.66	13.97	50.54	9.09	2.85	28.86	3.66	14.00	50.63	9.10
55.24	2.22	12.69	1.82	6.24	21.79	. .	4.96	28.35	4.06	13.94	48.59	
0.90	2.93	22.62	3.92	8.11	61.52	3.65	2.95	22.82	3.95	8.20	62.08	3.68
62.23	1.54	22.62	0.88	3.54	9.19	. .	4.08	59.90	2.33	9.36	24.33	

* Determined by the diastase method, without previous washing with water, and calculated as starch.

VON NOORDEN'S LISTS OF ALLOWABLE FOODS

The following four tables are taken from von Noorden's article in The Twentieth Century Practice of Medicine:

TABLE I.

First Group.—Unconditionally Allowable Foods.

Fresh meat: All the muscular parts of the ox, calf, sheep, pig, horse, deer, wild and domestic birds—roasted or boiled, warm or cold, in their own gravy or with mayonnaise sauce.

Internal parts of animals: Tongue, heart, brain, sweetbreads, kidneys, marrow-bones—served with non-farinaceous sauces.

Preserved meats: Dried or smoked meat, smoked or salted tongue, ham, smoked breast of goose, American canned meats, Australian corned beef.

Fresh fish: All kinds of fresh fish, boiled or broiled, prepared without bread-crumbs or crackermeal, and served with any kind of non-farinaceous sauce, preferably melted butter.

Preserved fish: Dried fish, salted or smoked fish, such as codfish, haddock, herring, mackerel, flounder, salmon, sardellen, sprats, eels, lampreys, etc., tinned fish, such as sardines in oil, anchovies, etc.

Fish derivatives: Caviare, cod-liver oil.

Shell-fish: Oysters, mussels, and other bivalves, lobster, crawfish, crabs, shrimp, turtle.

Meat-extracts: Meat peptones of all kinds.

Eggs: Raw or cooked in any way, but without any admixture of flour.

Fats of all kinds, animal or vegetable.

Fresh vegetables: Green lettuce, endive, cress, spinach, cucumbers, onion, leeks, asparagus, cauliflower, red and white cabbage, sorrel, French beans. The vegetables, as far as they are suited to this mode of preparation, are best cooked with meat broth or a solution of Liebig's extract and salt, and covered plentifully with butter, lard, suet, or goose-fat. The addition of flour is not permissible.

Preserved vegetables: Tinned asparagus, French beans, pickled cucumbers in brine or vinegar, mixed pickles, sauer-kraut, olives.

Spices: Salt, white or black pepper, Cayenne pepper, curry, cinnamon, cloves, nutmeg, English mustard, anise-seed, caraway-seed, parsley, dill, borage, pimpernel, laurel, capers, chives, garlic, etc. Many of these spices contain, indeed, a rather large percentage of carbohydrates, but they are added to the food in such small quantities that this may be disregarded.

Soups: Clear soups and broths, with or without eggs, marrow, fresh or dried vegetables (Julienne), clear turtle soup, etc.

Cheese: Stracchino, Neufchâtel, old Camembert, Gorgonzola, and all other fatty or so-called cream cheeses.

Beverages: All kinds of natural or artificial carbonated waters, either clear or with lemon-juice and saccharin or glycerin, or with rum, cognac, whisky, arrack, cherry brandy, plum brandy, Nordhäuser, rye whisky, etc. Light Moselle or Rhine wines, claret, or Burgundy in amounts prescribed by the physician. Coffee, black or with cream, without sugar, but sweetened with saccharin if desired. Tea, clear or with cream or rum.

TABLE II.

Second Group.—Foods Permissible in Moderate Quantities.

These contain carbohydrates, but in so little amounts that they need not be considered, and demand no compensation by a reduction in the allowance of bread. Some of the articles contain a rather large percentage of carbohydrates, but the absolute quantity in which they are consumed is small.

The amounts here given have been fixed by practical experience, and it will seldom be found necessary to increase them. Of the dishes here given, when they are allowed at all, only a few—from two to four—are to be selected each day. It is possible in this way to secure a great variety in the patient's dietary.

Internal parts of animals: Calves' liver, giblets—up to 100 grams.

Sausage: Liver sausage, preferably the fatter kinds, liver sausage with truffles, black pudding—90 grams. Meat sausage—80 grams. German sausage, Frankfurter sausage, and the like, brawn, head-cheese, sausage-meatballs—100 grams.

Patties: Pâté-de-foie gras, potted beef, ham, tongue, salmon, lobster, anchovies, etc.—one-half to one tablespoonful.

English sauces, such as Worcestershire, Harvey, beefsteak, anchovy, lobster, shrimp, India soy, China soy—one teaspoonful.

Cream, from four to six tablespoonfuls a day.

Cocoa, prepared without sugar—25 grams.

Cheese: Emmenthal, Romadur—60 grams; Gervis, Stilton, Brie, Holland, Gruyère—50 grams; Edam, Cheddar, Gloucester, Roquefort, Parmesan—30 grams; Cheshire—25 grams.

Vegetables (prepared without flour or sugar): 5 Teltower turnips; salsify, turnip-rooted celery, turnips, cabbage, pumpkin—2 tablespoonfuls; green peas, beans, carrots, Brussels sprouts—1 tablespoonful; 1½ artichokes; 1 truffle; 5 medium-sized mushrooms; 1 tablespoonful of morels or other edible mushrooms.

Raw vegetables: 8 radishes; 2 sticks of celery; 2 medium-sized tomatoes.

Nuts: 2 walnuts; 6 hazelnuts; 3 almonds; a thin slice of cocoanut; 8 Brazil nuts.

Fresh fruits: 1 thin slice of melon; 1 small tart apple; 1 or 1½ peaches; 1 spoonful of raspberries or strawberries; 4 spoonfuls of currants; 6 green gages; 12 cherries; one-half of a medium-sized pear; corresponding amounts of other fresh fruits.

TABLE III.

Third Group.—Conditionally Allowable Foods.

The condition under which dishes from the following table are permitted is that an equivalent shall be deducted from the allowance of bread. The amounts given below are the equivalents of 50 grams of white bread, containing about 30 grams of starch. Advantage is taken of the fact that larger amounts of certain carbohydrates (cane-sugar, milk-sugar, fruit-sugar, etc.) may be allowed than of starch. Some of the dishes given in the preceding table appear again here because, if they are eaten in large quantities, an account must be taken of the carbohydrates which they contain:

1 liter of milk (sweet, sour, or buttermilk).

1½ liters of kumiss, prepared in the Russian way.

1 to 1½ liters of kefir, fermented for at least two days and prepared without the addition of sugar.

1 liter of cream.

60 grams of rye bread, Graham bread, or Hamburg pumpernickel.

65 grams of Westphalian pumpernickel.

100 grams of aleuronat bread, prepared after Ebstein's formula (containing 27.5 per cent. of carbohydrates and 32 per cent. of vegetable albumin; the aleuronat breads are very variably compounded).

35 grams of zwieback and simple coffee-cakes, made without sugar.

30 grams of English cakes of various sorts.

30 grams of "Eichel-cacao" (Stollwerck's).

50 grams of chocolate (Stollwerck's).

40 grams of chocolate (French make).

40 grams of chestnuts shelled or 60 grams unshelled.

35 grams of cane-sugar, brown sugar, or rock-candy.

35 grams of sweet preserves.

40 grams of fruit-sugar.

40 grams of milk-sugar.

50 grams of fruit-jam.

40 grams of honey.

40 grams of flour—wheat, rye, barley, buckwheat, millet, or oatmeal or corn meal.

45 grams of bean, pea, or lentil flour.

35 grams of starch preparations, potato, wheat, or rice, starch, tapioca, sago, maizene, mondamin, etc.

35 grams of rice.

35 grams of farinaceous preparations—noodles, macaroni, oatmeal, grits, barley.

50 grams of lentils, peas, beans (weighed dry).

100 grams of green peas.

180 grams of new potatoes.
140 grams of winter potatoes.
120 grams of apples, pears, green gages, plums, damsons, mirabelles, apricots, cherries, grapes.
200 grams of strawberries, raspberries, gooseberries, mulberries, currants, blackberries, whortleberries, blueberries.
3 peaches.
40 grams of figs.
3 bananas.
A handful of walnuts, hazelnuts, almonds, or Brazil nuts.
⅜ liter of beer of any sort.
⅙ liter of sweet wine.

TABLE IV.

Fourth Group.—Especially Valuable Foods.

The great value of the following articles, of which, however, there is but a small choice, is due in part to the high percentage of protein and in part to that of fat. The proportion of albumin and fat is given for each 100 grams of the food-substance. Some contain carbohydrates also, the percentage of which is given for the sake of completeness, but its nutritive value is not counted.

100 Grams.	Protein	Fat	Carbo-hydrate	Caloric value.
Vegetable oil		100	..	930
Butter	1	85	0.5	830
Bacon (salt or smoked)	10	76	..	748
Devonshire cream	2	57	2	538
Cream cheese (Gervais, Neufchâtel, Stilton, Stracchino, etc.)	19	41	1	451
German sausage (Cervelatwurst)	18	40	..	446
Ham	25	36	..	437
Cheddar cheese	28	33	2	422
Fat pork	14	37	..	400
Smoked ox-tongue	24	32	..	396
Fatty cheese (average)	25	30	1.5	381
Yolk of egg	16	31	0.5	354
Fat goose	16	30	..	345
Fat beef and mutton	17	29	..	337
Brie cheese	19	26	1	320
Fresh water-eel	13	28	..	312
Smoked mackerel	19	22	..	382
Caviare	31	16	..	276
Cream	4	23	4	230
Fat salmon (fresh or smoked)	22	13	..	210
Hens' eggs (weighed with the shells)	12	10	0.5	142

Carbohydrate Equivalents.—Various tables have been advised to show at a glance the amounts of different articles of diet that can be substituted for given amounts of ordinary wheat bread. One of the most practical of these is that of Carter (The Medical Record, 1911), which shows the amounts as compared with 7.5 to 75 grams (¼ to 2½ ounces). The carbohydrate tolerance is determined usually by giving wheat bread, and should it be desired to convert this quantity into other articles of food the quantities can be determined. The equivalents for any given day should not exceed the total quantity of white bread that would be allowed. For example, if it has been determined that 45 grams of white bread could be allowed, the following diet should be substituted, as it represents the carbohydrate equivalents:

Potato	22.0 gm. equals	7.5 gm. of white bread.
Oatmeal	40.0 " "	7.5 " " "
Cornmeal	20.0 " "	15.0 " " "
Carrots	65.0 " "	7.5 " " "
Orange	40.0 " "	7.5 " " "
	187.0	45.0

White bread.	¼ oz. or 7.5 gm.	½ oz. or 15 gm.	1 oz. or 30 gm.	1½ oz. or 45 gm.	2 oz. or 60 gm.	2½ oz. or 75 gm.
Potato	22	44	88	132	176	220
Hominy (cooked)	25	50	100	150	200	250
Oatmeal (cooked)	40	80	160	240	320	400
Rice (cooked)	15	30	60	90	120	150
Farina (cooked)	25	50	100	150	200	250
Shredded wheat	5	10	20	30	40	50
Macaroni (cooked)	30	60	120	180	240	300
Brown bread	10	20	40	60	80	100
Corn bread	10	20	40	60	80	100
Rye bread	9	18	36	54	72	90
Graham bread	9	18	36	54	72	90
Biscuit	8	16	32	48	64	80
Roll, French	8	16	32	48	64	80
Roll, Vienna	8	16	32	48	64	80
Crackers (Boston)	6	12	24	36	48	60
Crackers (Graham)	6	12	24	36	48	60
Crackers (oyster)	6	12	24	36	48	60
Pretzel	6	12	24	36	48	60
Chocolate cake	7	14	28	42	56	70
Gingerbread	7	14	28	42	56	70
Sponge cake	7	14	28	42	56	70
Cookies (molasses)	6	12	24	36	48	60
Lady fingers	6	12	24	36	48	60
Doughnuts	8	16	32	48	64	80
Almond meal	65	130	260	390	520	650
Vegetable gluten	17	34	68	102	136	170
Soya bean meal	50	100	200	300	400	500
Milk (whole)	112	224	448	672	896	1120
Cream	112	224	448	672	896	1120
Grape-fruit, weighed with skin	187	375	750	1125	1150	1875
Beer (Pilsner)	125	250	300	450	600	850
Apple pie	10	20	40	60	80	100
Custard pie	17	34	68	102	136	170
Lemon pie	12	24	36	60	72	96
Rice pudding	14	28	56	84	112	140
Tapioca pudding	15	30	60	90	120	150
Lima beans	50	100	200	300	400	500
Beets (cooked)	65	130	260	390	520	650
Carrots	65	130	260	390	520	650
Corn (canned or green)	22	44	88	132	176	220
Egg-plant	90	180	360	540	720	900
Parsnips	35	70	140	210	280	350
Green peas	30	60	120	180	240	300
Potatoes (sweet)	10	20	30	50	60	80
Turnips	56	112	224	336	448	560
Apples	45	90	180	270	360	450
Bananas	20	40	80	120	160	200
Grapes	32	64	128	192	256	320
Muskmelon	112	224	448	672		
Oranges	40	80	160	240	320	400
Peaches	50	100	200	300	400	500
Pears	30	100	200	300	400	500
Prunes	24	48	96	144	192	240
Strawberries	65	130	260	390	520	650
Watermelon	225	450	900			
Peanuts	20	40	80	120	160	200
Chocolate	15	30	60	90	120	150

GOUT AND GOUTINESS

Sydenham said: "Great eaters are liable to gout, and of these the costive more especially. Eating as they are used to eat when in full exercise, their digestion is naturally impaired. Even in these cases simple gluttony and the free use of food, although common

incentives, by no means as frequently pave the way for gout as reckless, inordinate drinking.'' This statement is as near the truth as anything that has been said since.

The **causes** of gout are to be considered then as due to the following:

1. **Alcoholism,** of which Garrod wrote: ''With an absence of alcohol in any shape, coupled with an absence of hereditary predisposition derived from alcohol-drinking ancestors, gout would practically be unknown.''

2. **Overeating,** which some observers have placed on a level with overdrinking; the one usually, however, accompanies the other in those who suffer from ''exposure to luxury.'' Food unearned by physical exertion is the food that usually causes the trouble, although gout occasionally occurs in athletes who take an abundance of exercise. The latter class of patients generally suffer for the sins of their ancestors, for gout follows the old Mosaic law.

3. **Heredity.**—Gout, as is well known, is a family disease, and presents itself either as true gout or in the form of an arthritic or rheumatic tendency.

4. **Indigestion** is a potent factor in the causation of gout. It has been said that ''Gout is generally acquired with the help of a sound stomach,'' but the stomach rarely remains sound for any length of time.

5. **Constipation** is a factor not to be overlooked. The gouty not only prove to be costive, but suffer from the effects of the constipation, a fact to be borne in mind in arranging diet-lists for the gouty.

6. **Workers in lead** are especially prone to gout. **Mental work,** while it does not cause gout, may lead to it indirectly. As Ewart says: ''It does not fulfil the letter of the law that we shall earn our own bread by the sweat of our brow.''

The physiology of gout is still shrouded in considerable mystery. As early as 1848 Garrod showed that the blood of gouty persons contained abnormal quantities of uric acid. This has been confirmed by many observers. A discussion of uric acid, and the various theories concerning it and gout need not be considered here, as the ideas of investigators have changed rapidly during the past few years, and doubtless will continue to do so. Those interested should consult the recent articles by Brugsch and Schittenhelm, Schmidt, Magnus-Levy, and others.

It is agreed that the essential factor in the production of gout is a disturbance of purin metabolism. (See same.) The purin bodies are a group of chemical compounds containing C_5N_4. Uric acid is the most important of these, but there are others, as xanthin, hypoxanthin, caffein, thein, theobromin, guanin, and adenin. The purin bodies found in the urine may be either endogenous in origin, that is, those formed in the body; or exogenous, as those taken in the body

as food. Purin metabolism is supposed now to be carried out through the agency of several different enzymes which are in various organs of the body, and there are different enzymes for each form of purin. The endogenous purins are formed from the catabolism of the nuclei of the cells, and this goes on quite independent of the purin bodies introduced in the food, so that even if a gouty individual is kept on purin-free food for months, uric acid may be demonstrated in appreciable quantities. In normal individuals fed on purin-free diet the blood is free from uric acid.

In gouty individuals there is apparently a slow formation of uric acid from nucleic acids; a slow destruction of uric acid; delayed excretion of the uric acid through the kidney, and as a consequence of these an increase in the monosodium urate in the blood to even more than 8 milligrams per 100 c.c. During the attack of gout the amount of uric acid in the urine is increased, but just before an acute attack and just after it the amount is decreased. Uric acid is also found to be increased in the blood in pneumonia, chronic interstitial nephritis, and myelogenous leukemia.

In the diagnosis of gout the estimation of the urate in the blood and the quantitative estimation of the uric acid in the urine, on a diet free from purin nitrogen and after the addition of purin-containing foods, have been found of value. The method of von Noorden is to place the patient on a purin-free diet, and estimate the endogenous uric acid in the urine. Then 400 grams of beef, weighed raw, are given on two successive days, 150 grams at breakfast and 250 grams at noon. Von Noorden estimates the 400 grams of beef to contain 0.24 gram of purin bodies, half of which disappears in the body, but the remainder should be eliminated in the urine either as uric acid or purin bases. Normally, the elimination of this amount takes place during the two days of the experiment or a day or two later, but in gout there may be a considerable retardation. If there is retention of purin nitrogen in the body, the amount of food containing it should be reduced. A patient will often tolerate smaller amounts with complete elimination, when larger amounts cause retention. The tolerance and the allowance of purin-containing foods may thus be determined, and the case studied much in the same way as the tolerance for carbohydrate as followed in diabetes. A simple method of estimating the uric acid in the urine is by the purinometer of Walker Hall, which depends upon the precipitation of the uric acid with a silver solution, and the reading of the amount of settled precipitate in a specially graduated tube. The exact degree of accuracy of this method has yet to be determined.

The principal foods containing purin bodies are meats, fish, peas, beans, asparagus, onions, mushrooms, tea, coffee, chocolate, and perhaps oatmeal. Milk, cheese, butter, and eggs do not contain purin

bodies. Eggs cause an increase in the amount of uric acid excreted, while alcohol affects individuals differently in this respect.

The following tables, taken from Walker Hall's book, "The Purin Bodies of Food Stuffs," show the amounts of purin bodies in various food materials:

	Percentage of purin nitrogen.	Average percentage of nitrogen.	Calculated as purin bodies.	Undried as grams per kilo.	Purins as grains per pound.
Cod	0.0219	0.0233	0.0582	0.582	4.074
Plaice	0.0334	0.0318	0.0795	0.795	5.565
Halibut	0.0405	0.0408	0.1020	1.020	7.140
Salmon	0.0482	0.0466	0.1165	1.165	8.155
Tripe	0.0235	0.229	0.0572	0.572	4.007
Australian mutton	0.0365	0.0386	0.0965	0.965	6.755
English mutton	0.0411				
Loin of veal	0.0454	0.0465	0.1162	1.162	8.137
Neck of veal	0.0300				
Loin of pork	0.0485	0.0485	0.1212	1.212	8.487
Neck of pork	0.0257	0.0227	0.0567	0.567	3.969
Ham	0.0505	0.0492	0.1155	1.155	8.085
Ham fat	0.0419				
Ribs of beef	0.0455	0.0455	0.1137	1.137	7.959
Sirloin of beef	0.0506	0.0522	0.1305	1.305	9.135
Steak	0.0826	0.0826	0.2065	2.066	14.455
Liver	0.1125	0.1101	0.2752	2.752	19.264
Thymus (sweetbread)	0.4025	0.4025	1.0063	10.063	70.431
Chicken	0.0546	0.0518	0.1295	1.295	9.065
Turkey	0.0504	0.0504	0.1260	1.260	8.820
Rabbit	0.0305	0.0380	0.0970	0.970	6.314

Certain meats appear richer in purins than others but with the exception of liver and sweetbread, when the amount of each sort necessary to provide the requisite amount of protein or the feeling of satisfaction, is calculated, there is not much difference between the species.

The legumes—oatmeal, asparagus, and potatoes—it will be noted contain some purin bodies.

Various beverages contain purin bodies, especially tea, coffee, and cocoa.

The purin bodies in coffee, tea, and chocolate are largely methyl purins, and they do not undergo the same metabolic changes as the others, and they need not be excluded from the diet of the gouty as rigorously as the other forms. Some authorities, however, advise that caffein-free coffee be used. Alcohol is apparently injurious on account of its retarding purin metabolism. There is a difference of opinion concerning the purin content of oatmeal.

Another suggestion that has been made by Cohn is to avoid foods containing much sodium and to use foods containing potassium, as rice. These potassium-containing foods, he believes, act by aiding in

	Purin bodies (grains per pint)		Purin bodies (grams per liter).
Tea	1.2	Lager Beer	0.125
Coffee	1.7	Pale ale	0.145
Chocolate	0.7	Porter	0.155
Cocoa	1.0		

	Percentage of purin nitrogen.	Percentage calculated as purin bodies.	Grams per kilo.	Grains per pound.
White bread	No trace.			
Oatmeal	0.0212	0.0530	0.530	3.4563
Rice	No trace.			
Pea meal	0.0156	0.0390	0.390	2.5413
Beans (haricot)	0.0250	0.0637	0.6375	4.1661
Lentils	0.0250	0.0637	0.6375	4.1661
Lentils (malted)	0.0150	0.0375	0.3755	2.3340
Potatoes	0.0008	0.0020	0.0200	0.1400
Onions	0.0031	0.0090	0.090	0.0630
Tapioca	No trace.			
Cabbage	"			
Lettuce	"			
Cauliflower	"			
Asparagus (cooked)	0.0086	0.0215	0.215	1.5050

the excretion of the sodium. The same is accomplished by the use of potassium salts and by acids. Large doses of hydrochloric acid taken over long periods of time have been strongly recommended. The tendency of modern therapy in gout is away from the use of alkalis as formerly given. This is particularly true of the treatment of those cases in which there is subacidity.

Exercise, if properly supervised, is very useful, and the drinking of large quantities of water is usually advised, as it aids materially in excretion. It may be taken hot when the stomach is empty if it interferes with digestion or if there is a tendency to obesity. The quantity of fluid administered should be duly considered with regard to the heart action.

The arrangement of the diet for the gouty is attended by many difficulties. Many gouty persons are well-to-do, and have been accustomed to rich food, and they do not care to give it up. They suffer from many idiosyncrasies, some real, but more fancied. There can, however, be no question that what will cause trouble in one gouty patient may be taken with impunity by another. If the patient is affected with any other disease in addition to his gout, this will also have to be taken into account in arranging the diet. Heart disease, arteriosclerosis, and chronic nephritis are not uncommon, particularly in the cases of long standing.

In a general way it may be stated that a varied and simple diet of plainly prepared foods is the best.

Sydenham wrote: "The more closely I have thought upon gout, the more I have referred it to indigestion." This suggests the second indication—the relief of dyspepsia. Anything that will improve the digestion of the patient will add to his comfort.

Preventive Treatment.—Individuals with a gouty tendency will do well to follow a dietary such as is suggested for chronic gout. Children of gouty parents or of gouty ancestry should receive a carefully regulated diet from childhood. Sugars and sweets should be used sparingly, alcohol should be prohibited, and tea and coffee taken moderately, if at all, and not until some time after puberty. In a general way a simple varied diet should be allowed in which the purin nitrogen does not figure too prominently. Restrictions in diet are not apt to be followed unless there has been an attack of the disease or of one of the allied affections, as asthma or eczema. Outdoor exercise is of great help.

Diet in Acute Gout.—The diet in the *young* and the *plethoric* will differ from that in the *old* and *asthenic.*

In a primary paroxysm the food should be light, and preferably in a fluid form. Plenty of water should be given, and in the full blooded there is no objection to withholding all food for a short time. In the weak and the aged food should be given at regular intervals: milk, bread and milk, farinaceous foods, especially rice. Sago and tapioca and similar foods may be used. Eggs may be added next if they agree, and vegetable soups, potato, carrots, and cauliflower may be given. The return to the regular diet should be made gradually, adding butter, cream, bacon, fruit, then boiled (white) fish. The plainer, more easily digested meats may be added last of all. All the foods containing purins in any quantity should be avoided for some time. If it is possible to estimate the purin tolerance, as suggested above, it will give a good guide as to the amount to be allowed. If this cannot be done the diet will have to be regulated according to clinical observation. Purin fast days, from one to six a week, according to the condition of the patient and his excretion, is an easy and convenient way of controlling the intake of purin foods. In alcoholics, should it be deemed necessary, small amounts of well matured, pure whisky, well diluted with water, may be given. The minimum amount needed should be used, and none at all if it can be dispensed with without producing serious symptoms. Moderate drinkers and temperate people should not take alcohol at all.

Diet in Chronic Gout and Goutiness.—The gouty patient should be given definite directions as to what is allowable, and if he can be taught to have an eye to the future he may be permitted to manage his own diet to a very large extent. As has been well said, "A man after forty is either a fool or his own physician."

To begin with, in every case forbid all rich, fancy, and indigestible dishes, as well as all foods known to disagree with the patient. All

rich sauces and all poorly prepared foods should be warned against.

The aim in the gouty is to give sufficient protein food, but the exact amount that produces the best results will doubtless always be an individual question, although eventually studies in gout metabolism may throw much light on this point. The minimum, naturally, should not be below that determined by Chittenden, and perhaps somewhat above this will be found to be best, that is, about 70 gm. of protein daily for an average-sized individual. This should be given largely as eggs and egg dishes, milk and milk dishes, and cheeses, together with what is derived from the vegetable part of the diet. The purin foods should be allowed as suggested above. It has been suggested that, as uric acid retention occurs more at night, the purin food is best given in the morning. Many cases may be allowed meat once a day and fish once a day, preferably not at the same meal. The white varieties of fish seem to be best according to clinical experiences. Fresh beef or mutton or poultry are, as a rule, digested better, and twice cooked and salt meats as well as salt fish are usually forbidden, but there may be exceptions to this.

The tolerance for fats varies. As a rule, a certain amount of butter, cream, olive oil, and crisp bacon may be allowed. If the fats cause indigestion the amounts should be lessened.

Sugars and sweets, as a rule, do not agree. Individual experience is the best guide; as a rule the minimum should be allowed. Honey or stewed fruits (compotes) are generally included in German dietaries.

Starchy foods, as breadstuffs, cereals, and potatoes, may be allowed according to the patient's ability to digest them without fermentation and flatulence. This is always an individual question and often a difficult one to decide. Many gouty patients are obese, and the starches in such should be reduced to a minimum. Oatmeal is not advisable on account of the high purin content. Vegetables may be given if well digested. It should be remembered that peas, beans, lentils, mushrooms, spinach, and peppers all contain considerable purin nitrogen. These should be allowed in moderation, sparingly, or not at all, according to the exigencies of the cases. Carrots, cauliflower, artichokes, salsify, turnips, onions, greens, cabbage, beets, etc., may be allowed. When sugar disagrees, carrots and beets may be restricted. Asparagus, rhubarb, tomatoes, and sorrel are questionable and certainly do not agree with some patients, possibly on account of acids.

As in all other things pertaining to the gouty diet, there is a great diversity of opinion concerning fruit. It depends largely on the individual patient. Grapes and oranges are, as a rule, best borne. Baked apples and stewed fruit come next. Some advise strawberries on account of the potassium contained, others forbid them. In some patients they cause considerable disturbance. If one wishes to try

potassium-containing fruits, a list will be found under the heading of Salts.

If the patient shows signs of any gouty disturbance a milk diet for a few days will be found of great service.

Care should be taken not to starve the patient. A sufficient amount of well-prepared food should be taken each day. There is no disease concerning which there is as much difference of opinion concerning diet, and the attempts to follow the directions of the older writers is apt to lead to starving the patient and unnecessary restriction.

100 Grams contain in terms of "Purin-nitrogen."

More than .1 gm.	.05–.1 gm.	.03–.05 gm.	.01–.03 gm.	None or less than .01.
Thymus (.33)	Beef kidney	Pork	Bacon	All fruits
Calves' liver (.11)	Squab	Veal	Oysters	Cereals
	Calves' tongue	Mutton	Crabs	Milk
Anchovy (.18)	Herring	Beef	Lobster	Cheese None
Sardines in oil (.14)	Trout	Roe	Sausage	Bread
	Salmon	Haddock	Peas	Eggs
	Perch	Chicken	Asparagus	Caviar
	Pike	Calves' brain	Mushrooms	Vegetables not in the other lists.
	Lentils	Codfish	Turnips	
		Spinach	Cabbage	

1 part of purin-base nitrogen, theoretically, can give rise to 3 parts of uric acid. Practically, 60 per cent. of the ingested purins appear in the urine as uric acid.

Coffee, tea and cocoa contain xanthin bases, but these are not excreted in the form of uric acid, hence need not be forbidden.

Such vegetables as radishes, water-cress, paprika, garlic, etc., are best omitted, not because they favor uric acid formation, but because they are renal irritants. The same is true of mustard-relishes, catsup, and the like.

Alcohol in all forms, is best avoided; it influences purin metabolism in ways unfavorable to the gouty individual, favors vascular sclerosis, etc.

Avoid meat extracts—bouillons, dish gravies, and the outer crusts of roasts.

The evening meal should be frugal and bland.

The best drink is undoubtedly, water; carbonated waters are permitted.

Lithia water is not a uric acid solvent.

Saline Springs.—Visits to mineral springs and the taking of mineral waters at home often exert a happy influence over some cases of gout. The nature of the water seems to be of secondary importance, for it seems to be the water, and not the salts contained in it, that is helpful. The relation of the various salts to gout is not thoroughly understood.

The following points, regarding the choice of a spring, are given by various authors:

For acute and periodic attacks of gout: Assmannshausen, Ems, Neuenahr, Royat, or Vichy.

For the plethoric and robust, where there is a strong hereditary predisposition or where there is stomach, intestinal, liver, or kidney disease: Carlsbad or Marienbad.

For chronic and debilitated cases: Kissingen, Homburg, Baden-Baden, Bourbonne-les-Bains, Harrogate, or Weisbaden.

For long-continued domestic use in mild cases: Gieshübel, Salvatorquelle, or Vals.

Among the American springs may be mentioned: Hot Springs, Va.; Hot Springs, Ark.; Hot Springs, N. C.; Mt. Clemens, Mich.; Las Vegas, N. M.; Sweet Springs, Pa.; Capon Springs, W. Va.; Glenwood Springs, Colo.; Coronado Springs, Colo.; Saratoga Springs, N. Y.; White Sulphur Springs, W. Va.; Bedford, Va.

Osler recommends the following: *American*—Saratoga, Bedford, and White Sulphur. *English*—Buxton and Bath. *French*—Aix-les-Bains and Contrexeville. *German*—Carlsbad, Wildbad, and Homburg.

Alcohol and Gout.—There is probably but little doubt as to the injurious effect of alcohol in gouty subjects, and it serves not only as a predisposing factor, but as an exciting cause. If the patient has never used alcohol or used it but sparingly, and if it is not needed especially as a stimulant, it should be excluded entirely from the diet. On the other hand, if the patient has been habituated to the use of alcohol, its withdrawal is often followed by serious consequences. This is most true in those who are weak, whose circulation is poor, or whose stomach demands an alcoholic stimulant before it begins work. Sydenham said: "The old saw is that if you drink wine you will have the gout, if you do not, the gout will have you"—in other words, "while it may be good for the patient, it is bad for the disease."

Alcohol is contraindicated in acute gout except in the weak and aged. In subacute gout and in chronic gout alcohol should be avoided wherever possible. When its use is necessary, the best form of alcohol for these patients is undoubtedly well-matured pure whisky sufficiently diluted with water. The daily allowance should be placed as low as possible—two ounces or double that quantity in some cases should ordinarily suffice. Good old brandy or gin may be substituted for the sake of variety. Wines and malt liquors are best avoided, but curious idiosyncrasies in regard to them exist. The choice of a wine for the gouty is a matter of personal taste and experience. All very sweet or acid wines are injurious. Ewart gives the following rules for choosing wines, and says that the best are those with a "moderate percentage of alcohol and of ether; least possible degree of acidity; freedom from unfermented sugar, as far as that is consistent with a natural unadulterated condition; freedom from tannin; genuineness as to vintage, or at least to derivation; mixed wines do the most harm; and lastly, matured age."

Good claret or a dry Moselle is perhaps the best, while champagne is perhaps the most injurious, wine for the gouty. This last, however, as most every variety of wine, has some enthusiastic advocates.

Tea and coffee may be allowed, but it is desirable that they be given unsweetened and not too strong. If, however, sweetening is

thought advisable, as it usually is, tablets of saccharin may be used in place of sugar.

The **Special diseases of the gouty** requiring particular attention are the following:

Gouty Glycosuria and Diabetes.—While a restricted diet is not desirable in these cases, large quantities of meat and heavy breads are generally productive of more harm than good. Very often, if the gouty condition receives proper attention, the glycosuria will be lessened or may even disappear entirely. A moderate quantity of meat and fish, with well-toasted bread, brown bread, pulled bread, rice, macaroni, and the like, in moderation are to be allowed, together with milk, cream, and fatty foods. If symptoms are present, a milk diet for a short period will usually be found beneficial. It is often well in these cases, even when the symptoms are not urgent, to give an occasional diet of milk.

Gouty Albuminuria.—In this condition the most suitable diet is one containing but a moderate quantity of meat of the least irritating character, such as the white meat of chicken, steak, chops and roasts. The meat should be lean. The white meat of boiled fish of the lighter varieties and the more easily digestible vegetables may also be permitted. Whenever the amount of albumin in the urine is very large, or when there are symptoms of nephritis, a milk diet may be given for a few days or a week at a time.

Acid Gouty Dyspepsia.—This is one of the most serious and most troublesome of the gouty affections. Many cases require a milk diet, and it may be necessary to peptonize the milk partially or completely. Peptogenic milk powder or one of the infant foods may also be used. Malted milk, albuminized foods, or the malted foods may be utilized.

In the less severe cases, lean meat and fish may be allowed in small quantities. Well-prepared vegetables may be given sparingly, while starches and fats are usually best avoided. The management of these cases is essentially the same as if gout were not present.

Gouty Obesity.—The management here is similar to that in other conditions. Ebstein regards obesity in the gouty as an unfavorable symptom, and recommends meat and fat and reduces the carbohydrate food to the smallest possible amount. His theory is that the fats protect the metabolism of the proteins to a smaller degree than do the starches and sugars. Sugar should be reduced, and only as little liquid as it is possible to get along with should be allowed. Some authors recommend alcohol in small quantities. Duckworth gives a small amount of red Bordeaux wine mixed with a little water. Open-air life—horseback riding or other outdoor exercise—is advisable. An occasional visit to some mineral spring as suggested above is often beneficial.

RHEUMATOID ARTHRITIS (ARTHRITIS DEFORMANS)

The diagnosis should be carefully made, particularly with reference to focal infections. Massage, hydrotherapy, and other physical therapeutic measures should be used in connection with diet. Pemberton and his associates have studied this disease.[1]

They noted a slight lag in the elimination of salt and water in some, a slightly lowered basal metabolism and high blood creatin which tended to disappear as cases improved, and there was also a lowered sugar tolerance more or less in proportion to the severity of the disease. The blood fats and cholesterol, the blood calcium, urea, and non-protein nitrogen were essentially normal. The lowered sugar tolerance grew less or disappeared with improvement, no matter what method of treatment was used, but the turn was most rapid after the removal of the foci of infection. Pemberton advises a diet of low value, reducing the proteins, and either eliminating the carbohydrates entirely or reducing them to a minimum. He found in a large number of cases of chronic arthritis, if the food intake was greatly reduced or the patient placed on a starvation diet, that within one to four days there was improvement in the patient's general condition, less tension of the soft tissue, and an added freedom of movement. At present there is no way of regulating the patient's diet except by the changes in the clinical picture. The number of calories ordinarily taken on should be estimated, and if found to be above the patient's needs, should be cut to as near the requirements as possible. For example, if the patient is taking 3200 calories, at least 1000 calories of this could be cut off with benefit. If, on the other hand, the intake was low, 2000 calories or less, as is frequently the case, the diet just mentioned would probably aggravate the condition. Pemberton regards the total caloric value of food of greater importance than determining the number of calories from protein, fat, and carbohydrates, although this latter computation should be made if the patient does not yield to the simpler dietetic changes. In more advanced cases, where the food intake is low, the periods of reduction to 1500 calories, or even for a short time to 1200 or 1300 calories may be made to advantage, but the patient should be at rest and the general nutrition always borne in mind, as prolonged starvation may lead to other serious difficulties, and one must always bear in mind the experience of the Frenchman whose patient died cured.

[1] Archives Internal Medicine, March and April, 1920, xxv, 231, 335; American Journal Medical Sciences, April 1921, clxi, 517.

Breakfast

			Calories.
1 apple	150	gm.	72
1 egg	50	"	83
Bread	30	"	81
Butter	15	"	120
Milk	60	c.c.	40
Sugar	20	gm.	80
Coffee			

Lunch

Bouillon	180	c.c.	
1 egg	50	gm.	83
String beans	100	"	17
Lettuce	40	"	
Mayonnaise	1	tablespoon	187
Bread	30	gm.	81
Butter	10	"	80
Orange	250	"	96

Supper

Steak	50	gm.	143
Beets	100	"	40
Lettuce	40	"	
French dressing	2	tablespoons	296
Oil	1⅓	"	161
Bread	30	gm.	80
Butter	15	"	120
Sugar	20	"	80
Milk	60	c.c.	40
1 apple	150	gm.	72
Total calories			2052

Breakfast

			Calories.
1 orange	250	gm.	96
2 eggs	100	"	166
Bread	30	"	81
Butter	15	"	120
Coffee			
Milk	60	c.c.	40

Lunch

Bouillon	180	c.c.	
Lettuce			
Mayonnaise	1	tablespoon	187
String beans	100	gm.	17
1 apple	150	"	72
Bread	30	"	81
Butter	10	"	80

Supper

Steak	50	gm.	145
Bread	30	"	81
Butter	15	"	80
Carrots	100	"	18
Lettuce			
French dressing	2	tablespoons	296
1 orange	250	gm.	96
Milk	60	c.c.	40
Tea			
Bouillon	180	"	
Total calories			1694

Breakfast

		Calories.
1 egg	50 gm.	83
Butter	15 "	120
Bread	15 "	40
Coffee		
11 A. M. black coffee		

Lunch

Bouillon	180 c.c.	
Lettuce	30 gm.	
French dressing	1 tablespoon	148
Bran biscuit		
Cabbage	50 gm.	3
3 P. M. black coffee		

Supper

Bouillon	180 c.c.	
1 egg	50 gm.	83
Bread	15 "	40
Butter	15 "	120
Lettuce	30 "	
French dressing	1 tablespoon	148
1 apple	150 gm.	72
Total calories		857

Breakfast

		Calories.
Coffee		
1 egg	50 gm.	83
Bread	30 "	41
Butter	20 "	160
1 apple	150 "	72

Lunch

Bouillon	180 c.c.	
Lettuce	30 gm.	
French dressing	2 tablespoons	296
Cabbage	50 gm.	3
Butter	10 "	30
Bran biscuit		
Black coffee		
1 egg	50 "	83

Supper

Bouillon	180 c.c.	
1 egg	50 gm.	83
Bread	30 "	81
Butter	20 "	160
Lettuce	30 "	
French dressing	2 tablespoons	296
1 orange	250 gm.	96
Total calories		1534

Breakfast

		Calories.
1 apple	150 gm.	72
1 egg	50 "	83
Bread	60 "	162
Butter	15 "	120
Sugar	20 "	80
Milk	60 c.c.	39
Coffee		

Lunch

			Calories.
Bouillon	180	c.c.	
Lettuce	40	gm.	
Mayonnaise	1	tablespoon	187
String beans	100	gm.	17
Bread	30	"	80
Butter	10	"	80
Orange	250	"	96
1 egg	50	"	83

Supper

Steak	50	gm.	143
Bread	60	"	160
Butter	15	"	120
Tea			
Sugar	20	"	80
Milk	60	c.c.	39
Beets	100	gm.	40
Lettuce	40	"	
French dressing	2	tablespoons	298
1 apple	150	gm.	72
Total calories			2051[15]

[15] It is to be appreciated that trifling differences occur in the caloric values quoted for various articles of food according to the table from which these values are obtained. It will, therefore, sometimes happen that there may be an apparent discrepancy of a few calories between the numbers indicated in the text and the summation of the detailed diets, but these are within the inevitable error in the administration of mixed food-stuffs at large.

OBESITY

Obesity is one of the conditions for which the physician is frequently asked to prescribe a diet cure. He should, therefore, be thoroughly informed concerning its causation, its management, and the reasons for and against reducing any given case.

There is probably no condition that has been more widely discussed by laymen of both ancient and modern times than obesity, for no disease is more thoroughly associated in the lay mind with its proper causes and its relations to diet than this ''oily dropsy,'' as Byron calls it. Among the better known examples that have been mentioned in fiction are Silenus and his son Bacchus, as well as the more modern Falstaff. Many historic characters were hampered by obesity. Epaminondas, the Greek senator, the Minstrel of Megara, with a three-yard girdle, and Eglon, king of Moab, are familiar examples. Chesterfield said: ''Obesity and stupidity are such constant companions that they are considered synonymous.'' There have, however, been numerous examples of men of extraordinary mental ability and even activity who were obese, but we are all inclined to remember the fat boy in Dickens' Pickwick Papers, who did nothing but eat and sleep.

The accumulation of fat is associated with increasing years, but it is by no means confined to either old or middle age, as is exemplified in the fat children familiar to all; extreme obesity may be a

plague even of infants. Chambers is said to have reported a case that he saw on exhibition at Manchester—a baby that weighed 90 pounds at six months. Numerous cases are on record where babies of this age weighed as much as forty pounds.

From Hippocrates' time down to the present day directions have been given for the cure of this troublesome condition. Shakespeare gave the essentials of the treatment and stated the dangers of obesity when he wrote:

> "Make less thy body hence, and more thy grace.
> Leave gormandizing; know the grave doth gape
> For thee thrice wider than for other men."

With Justus von Liebig's work came a better understanding of the formation of fat in the body, and while there are still very diverse opinions on the subject, the condition is, in the main, fairly well understood. In 1850 Chambers warned against fat, bread, and potatoes. In 1863 Mr. Louis Banting, an Englishman, published a letter giving an account of a method of diet that he had employed on himself with great benefit. This method was that of Harvey, who was Banting's physician. Harvey's name was withheld at the time, and as a result the name of Banting has become associated with reduction cures and obesity. Ebstein published his work in 1882, and there have been numerous authors and physicians who have formulated methods for, or made suggestions concerning, the treatment of obesity. Oertel was the first to point out that there was a close relation between obesity and weak heart, and he made abundant contributions to the literature on the correct management of these diseases.

The **causes of obesity** are so well known as to require only passing mention. About 50 per cent. owe their primary origin to hereditary causes. Women are more frequently affected than men. With the advance of years, in some there is a tendency to accumulate fat. Overeating and over-drinking have been named as causative factors, especially when combined with a quiet, sedentary life.

The fats and the carbohydrates are the principal elements in the diet that are apt to be converted into fat; but proteins also, if the supply exceeds the demand and assimilation is active, will be converted into body-fat and stored up in the subcutaneous tissues. The liver and heart are also converted into storehouses for fat, and later there may be a fatty degeneration of both organs, as well as of the coats of the arteries.

The dangers accompanying the excessive accumulation of fat are manifold, and include a large number of diseases that may be influenced by it either directly or indirectly. These will be discussed when the indications for reducing the weight of patients are considered. Weak heart, anemia, gout, and diabetes are among the most frequent diseases associated with obesity.

Treatment.—It is necessary, in attempting to treat this condition to distinguish between the cases that are plethoric and those that are anemic. One should, moreover, consider each case carefully, before reduction is decided upon. The condition of the blood, of the heart, and of the liver, and the rate of increase in the patient's weight, should all be considered.

The general appearance of the patient—whether the symmetry of the body is preserved or whether it is distorted by fat-deposits—is also to be studied. More important still is the condition of the functions of the body and the state of the nervous system. Of especial value is it to learn the amount of disturbance of respiration and of circulation.

The age of the patient is a factor of paramount importance. In persons under twenty reduction cures should not, as a rule, be used, but the diet should be so arranged that there will be no increase in the amount of fat deposited. When the weight is to be reduced, it should be done very gradually, and when from five to fifteen pounds have been lost, a season of rest should follow. The period of restricted diet should not exceed four or five weeks.

The reduction of patients from twenty to fifty years or older may be undertaken if other circumstances warrant it; this will be considered later.

During and even a little preceding the period of senescence reduction should not be permitted. The physical condition of the patient, rather than the number of years, should be the guide, for some persons grow old earlier than do others. The condition of the arteries is a good guide to senility, based on the dictum that a man is as old as his arteries. In persons in the decline of life reduction generally hastens very materially the breaking-down of the bodily forces.

The following suggestions concerning the various grades of the disease and their fitness for reduction cures will be found useful:

Advanced cases—and they may be judged from their general appearance and condition of health—are, as a rule, fit subjects for reduction.

In those who have been fat all their life or who have been fat for several decades, and who are approaching old age, a reduction cure should not be undertaken.

Average cases, where the weight is from thirty to fifty pounds above the average for their age, sex, and condition in life, should not be reduced if they are aged. If the extra weight is well borne, they do not need it, and the diet should be so arranged as to prevent any further increase. If there is any reason to fear disease, they should be reduced. If the patient takes a great deal of exercise, uses any quantity of alcohol, or is given to excesses in eating, or, in fact,

anything, he should be reduced, for the chances are that he will accumulate fat as time goes on or will become the subject of disease which his obesity will aggravate. Rapid reduction in these cases is bad as a rule, and it should be slow and systematic.

Slight degrees of obesity, where the body weight is from ten to thirty pounds over the average, do not need reduction, but only a careful regulation of the diet and mode of living, so as to prevent any further deposits of fat.

The question of reducing some of these patients must be considered, for while they unquestionably do perfectly well on a limitation of their increase in weight, still the question of personal appearance is an all-important factor with many women. It is more often the case with those slightly above the average than for those that are very obese, as the latter have become accustomed to their fat and are usually resigned to it. If these patients are not reduced the necessary few pounds, they will go to one physician after another until they find some one who will—generally a quack who may do more harm than good by his methods and advice. When the personal appearance can be used as an argument for the regulation of the diet and the manner of living, the physician has a hold upon the patient that he can scarcely get by any other means, and he may often prevent an accumulation of a troublesome amount of fat in after years by the careful instruction of the patient in the art of living as it must be practised by that particular individual. As Ebstein puts it, "Corpulence can only be permanently cured by a permanent change of life and diet, regulated by physiologic principles."

There are certain objections that may be raised to reduction in women. The loss of the abdominal fat may lead to constipation, to hernia, to gastroptosis, to dislocation of the kidney, and even of the uterus. Von Noorden states that these patients may develop gall-stone colic, which probably results from the pressure of the clothing on the liver, causing interference with the flow of bile, and consequently favors the formation of gall-stones. So long as the patients are obese the pressure exerted by the clothing is usually trifling and does not fall directly on the liver. These objections to reduction cures in women are more marked in mild than in the more advanced cases.

A much discussed point is whether it is possible to reduce any special part of the body more rapidly than the remaining parts. This is a method often sought by women who have borne several children and who have large deposits of fat in the abdominal walls, causing an unsightly prominence of the abdomen. If the fat is reduced slowly, every part of the body, including usually the abdomen as well, will be reduced simultaneously. If it is reduced rapidly, it seems to be removed principally from certain parts of the body, as the

neck, breasts, arms, and calves of the legs. Certain advocates of massage claim that the massage of the parts will cause a more rapid reduction. Von Noorden had one arm of an obese patient massaged for six weeks. At the end of that time the arm that had been massaged had increased one and one-half centimeters in circumference, whereas the arm that had not been massaged remained the same.

Massage of the abdomen during a reduction cure may exert a beneficial effect by relieving the constipation, which is apt to be troublesome. Exercise is still more potent, particularly for reducing the abdomen. This is accomplished by standing erect and then bending forward in an effort to touch the toes with the tips of the fingers. Too much should not be expected from this, even when persisted in faithfully.

When disease exists together with obesity, a reduction cure is often indicated, and it is frequently the most important part of the treatment, although it is one that is too often overlooked. In such cases a reduction of the amount of fat may not only render the patient more comfortable, but in many cases may be the direct means of prolonging the patient's life and period of usefulness. In these cases reduction is not to be regarded as a weakening process, the reverse being true—the patients usually grow stronger as their weight grows less. It must be borne in mind, however, that each case is to be studied carefully and treated individually, for no general rule can be made to apply to every case that comes under the physician's care. This applies not only as to the question of reduction, but also to the manner in which this is to be accomplished.

Diseases Combined with Obesity.—Diseases of the Circulatory System.—To Oertel belongs the credit of pointing out the great benefits to be derived from a rational method of treating affections of the heart when combined with obesity. Benefit follows not only in patients with valvular lesions, but in those suffering from other diseases as well. Among these conditions may be mentioned arteriosclerosis, myocarditis, degeneration of the heart muscle, the so-called fatty heart, aneurysm of the aorta, and those diseases of the chest or respiratory organs that interfere with the circulation.

The reduction of the body weight in these cases, it should be understood, does not alter the character of the lesion itself, but it lessens greatly the work of the heart, and permits of more complete oxidation of the blood. It is of especial value in those cases where the existence of the lesion itself is not incompatible with the life of the patient so long as he is kept in reasonably good condition. If reduction is undertaken before there is any failure of compensation, the results are, as a rule, very gratifying. If compensation is on the verge of rupture, or if it has actually begun, it may often be checked to a remarkable degree and sometimes averted altogether. Reduction may work wonders even in what at first seem to be very severe cases. In

the hopeless cases it is useless to attempt it. One should not, however, be too hasty in deciding that a case is hopeless, for even very serious cases may be relieved.

The suggestions for treatment made by Oertel are most useful, and will be given further on. For patients where compensation is perfect, but whose bodies are obese to a degree that seems to the physician to indicate danger, a rapid reduction cure may be instituted. Where there is beginning failure of compensation, Groedel, of Nauheim, von Noorden, and others recommend large doses of digitalis, to be followed by a somewhat rapid reduction. This may be effected by any method, but, according to the authors just named, those methods involving the use of salines should be avoided. The amount of fluid, as well as food, must be limited. The reduction is best undertaken at a sanitarium. For the first few weeks four or five pounds a week may be removed, and after that about that many a month.

The worst cases are those in which edema occurs together with obesity. In these cases, as a rule, not much is to be hoped for, and a reduction cure in the ordinary sense of the word should not be undertaken. These patients do not generally have any great desire for food, and hence the amount of liquid consumed should be the point of especial consideration. The heart should be stimulated, and later, if possible, exercises should be begun. Digitalis is, of course, of the greatest use in these cases. The food need not, as a rule, be limited, unless, as improvement sets in, fat be deposited; this is not, however, apt to be the case. (See also Karell Diet.)

Diseases of the Respiratory System.—These are to be considered principally in their relation to the circulation, and what has been said of heart diseases applies with equal truth to these. The most frequent respiratory disturbances are adherent pleurisy and emphysema. A kyphosis, by compressing the chest space, may also prove troublesome. A reduction of the body weight often brings about a marked improvement in these cases.

Bronchitis in fat, and especially in elderly, patients is apt to be very troublesome. In many patients a very resistant bronchitis, which does not yield either to drugs or to climatic treatment, occurs every winter. In these cases a reduction of the body weight, by allowing the patient to breathe deeply and with ease, will often be of more assistance in effecting a cure than all other measures combined.

Chronic and interstitial nephritis is also a disease in which the patient must either be reduced or at least the amount of food and drink be so limited as to prevent any further increase in weight. (See the section on Diseases of the Kidney.)

In many **diseases that affect the legs**, such as hemiplegias, cord disease, and neuritis, as well as the many surgical disorders affecting the feet or legs, a reduction in the body weight will often permit the

patient to go about with considerable ease, whereas if he is allowed to accumulate fat he may ultimately become practically helpless. The same may be said of chronic articular rheumatism, of arthritis deformans, or of osteo-arthritis affecting the lower extremities.

Obesity and gout form a combination that presents unusual difficulties in the selection of a proper diet. If the patients subsist on an anti-gout diet, they gain in weight, and if they adhere to a diet that aims to avoid gain in weight, they are apt to contract gout. (The reader is referred to the section on Gout for further information on this point.) One must choose between two evils and arrange the diet accordingly. As a rule, a diet of lean meat with an abundance of fresh fruit and green vegetables is, in the average case, the best.

There are many **nervous diseases** not included among those that render locomotion difficult that are frequently either benefited or entirely cured by a reduction in body weight if the patient has been much above the average. Most important of these are the various neuralgias, which are often the bane of fat persons. Sciatica and occipital, supra-orbital, and left-sided brachial neuralgia are among those nervous disorders that, according to von Noorden, may be most frequently relieved.

This same observer has pointed out another condition in which gain in weight should be limited—one that is frequently overlooked by the average practitioner. This is in **obesity following the cures for pulmonary tuberculosis.** These patients frequently take on large quantities of fat, and in some cases the very fatness they strive to acquire may be the means of their undoing, interfering, as it may, with exercise and with breathing. Fortunately this class of cases is not large. If they continue to gain in weight after the pulmonary disorder has been cured, or if the weight becomes a source of danger to them, the patient's diet should be so arranged as to limit the amount of fat deposited.

In all cases the patient must be told that it is only by perseverance that any permanent good can be effected. Little is to be gained by a few weeks' dieting or by a sojourn for a few weeks at a watering place if the diet is to be unrestricted thereafter. Many patients who will not persevere in the diet while at home do well at a resort, or, better still, at a sanitarium, where, in addition to being reduced in weight, they learn the art of living as well. In others it is better to prescribe short courses at various intervals. These may be of four or five weeks' duration, and after the patient has lost from five to fifteen pounds, he may be allowed some freedom in the interval.

Exercise is of the greatest importance, and should be carried out according to the suggestions made by Oertel. Exercise in the open air, such as walking either on level ground or uphill, as suggested by Oertel, is to be preferred to indoor exercise and gymnasium training. In certain towns in Germany, Austria, and Switzerland, as well

as in this country, what are known as "terrain cures" have been established; in these the paths are marked according to distance and as to the grade. The patient is carefully instructed by the physician as to how far he is to walk and on what grades. Similar walks may be planned by a physician anywhere if the country is of such a nature as to permit it. The amount of exercise should be carefully regulated, and the distance to be walked, rather than the time that is to be spent in walking, clearly outlined.

In cases with weak hearts prognosis is of especial importance. According to Oertel, if there is hydremia or circulatory disturbance, the prognosis will be governed by the difference in the quantity of fluid taken and the amount of urine excreted. For two days the patient should take as much fluid as he has been accustomed to, and the amount, as well as the quantity, of urine excreted, noted. For two days more the amount of fluid should be reduced to from 700 to 1000 c.c., and the urine should again be measured. If with the reduced amount of fluid the urine is equal in quantity to, or larger than, the amount of liquid ingested, it is a sign that the heart power is not excessively weak and that the kidneys are in fair condition, and a favorable prognosis may be given, providing the proper regimen be followed out. If the amount of urine excreted is less than the quantity of water ingested, the prognosis is unfavorable. If the urine is only slightly less, this may be regarded as an actual increase, as from 18 to 20 per cent. of that taken, as well as the amount in the solid food, is given off with respiration, perspiration, etc. If there is arteriosclerosis, fever, or diabetes, the prognosis is unfavorable.

Prophylaxis of Obesity.—In all persons with a hereditary tendency to obesity, and in all obese persons who have become thin, prophylactic measures should be undertaken. These consist in an avoidance of fat-forming foods, and, if necessary, in a careful regulation of the diet and of the amount of exercise. As the individual grows older and the danger of obesity becomes more pronounced, the diet should always be regulated and the proper amount of exercise insisted upon.

Diet Cures.—In the past there have been a great many different methods of dieting for purposes of reducing the weight. These have all been more or less successful, though they were based on many different conceptions of what the underlying source of the trouble was. Very often reduction cures are spoken of as banting. This method, which has been mentioned, was used by Banting, who reduced his weight from 202 to 156 pounds, a loss of 46 pounds. The details of this and the other cures mentioned will be found in any of the first four editions of this book. The Banting diet was very severe and for the average patient needed modification, whereas it is entirely unsuited for those with weak digestion. Following its use renal colic or gall-stones with colic are very apt to occur.

Other methods that have been popular at various times are those devised by Schweniger, whose fame was greatly enhanced by the fact that he was Bismarck's physician. He insisted upon the patient not taking any fluid with the meals nor for two hours after; Schleicher, who advised a very similar diet, whereas Germain Sée used a diet in which the fluid, instead of being diminished, was increased in amount. Weir Mitchell's method consisted of putting the patient on a skim milk diet or a skim milk diet with the usual food and in a week cut out everything except the skim milk. The quantity of this is gradually diminished till the patient loses half a pound of weight each day or less, according to the general condition. In the early part of the treatment the patient is kept in bed and given massage and later Swedish movements. (See also Karell Diet.) In case of any feebleness the diet is increased and when the patient is reduced to the desired point a careful diet is outlined to prevent the recurrence. The Salisbury method consists of using only meat and hot water. The water may be flavored with lemon juice or weak tea, if desired. Yeo suggested a dietary much on the order of that used at the present time. The Chambers method is interesting as being one of the earliest systemic modes of treatment and consisted of cutting off the fats and carbohydrate food, and giving lean meats and green vegetables and salads and fruits.

The present conception of obesity is that it may be divided into two groups; first, the so-called exogenous obesity. in which the metabolism of the patient is normal, but in which the patient is either taking more food than the body requires or is taking that required by a person in active life and living a life of laziness, or there may be a combination of overnutrition and laziness. The second group is called the endogenous or constitutional obesity and has for its underlying cause a slowing of the nutrition, so that the food is not metabolized as rapidly as in normal individuals. These cases are most commonly due to hypothyroidism or to disturbances of the ovaries or testicles, sometimes called eunuchoid obesity, or to changes in the hypophysis cerebri, the so called adiposis genitalis, or the obesity of Frölich, very similar to the eunuchoid type. Obesity may also occur very probably from over-action of the pineal gland and experimental obesity due to pancreatic changes has been produced. Not infrequently one sees a combination of both exogenous and endogenous obesity, particularly in early life.

To determine the percentage of overweight or underweight of an applicant, select the normal weight for his age and height from Table No. 1. Then opposite the normal weight, as indicated by the heavy faced type on Table No. 3, you will find the percentage of overweight or underweight nearest his actual weight.

FOR MEN
Table No. 1
STANDARD WEIGHT COLUMNS
TABLE OF HEIGHT AND WEIGHT AT DIFFERENT AGES

Ages	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
5 ft. 0 in.....	115	120	125	128	131	133	134	134	134	131	
5 ft. 1 in.....	118	122	126	129	131	134	136	136	136	134	
5 ft. 2 in.....	120	124	128	131	133	136	138	138	138	137	
5 ft. 3 in.....	123	127	131	134	136	139	141	141	141	140	140
5 ft. 4 in.....	127	131	135	138	140	143	144	145	145	144	143
5 ft. 5 in.....	130	134	138	141	143	146	147	149	149	148	147
5 ft. 6 in.....	134	138	142	145	147	150	151	153	153	153	151
5 ft. 7 in.....	137	142	147	150	152	155	156	158	158	158	156
5 ft. 8 in.....	141	146	151	154	157	160	161	163	163	163	162
5 ft. 9 in.....	145	150	155	159	162	165	166	167	168	168	168
5 ft. 10 in.....	149	154	159	164	167	170	171	172	173	174	174
5 ft. 11 in.....	154	159	164	169	173	175	177	177	178	180	180
6 ft. 0 in.....	160	165	170	175	179	180	183	182	183	185	185
6 ft. 1 in.....	163	170	177	181	185	186	189	188	189	189	189
6 ft. 1 in.....	168	176	184	188	192	194	196	194	194	192	192
6 ft. 3 in.....	172	181	190	195	200	203	204	201	198		

FOR WOMEN
Table No. 2
STANDARD WEIGHT COLUMNS
TABLE OF HEIGHT AND WEIGHT AT DIFFERENT AGES

Ages	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50 and over
4 ft. 11 in............	111	113	115	117	119	122	125	128
5 ft. 0 in............	113	114	117	119	122	125	128	130
5 ft. 1 in............	115	116	118	121	124	128	131	133
5 ft. 2 in............	117	118	120	123	127	132	134	137
5 ft. 3 in............	120	122	124	127	131	135	138	141
5 ft. 4 in............	123	125	127	130	134	138	142	145
5 ft. 5 in............	125	128	131	135	139	143	147	149
5 ft. 6 in............	128	132	135	139	143	146	151	153
5 ft. 7 in............	132	135	139	143	147	150	154	157
5 ft. 8 in............	136	140	143	147	151	155	158	161
5 ft. 9 in............	140	144	147	151	155	159	163	166
5 ft. 10 in............	144	147	151	155	159	163	167	170

Table No. 3

Underweight			Standard	Overweight			
25%	20%	15%		20%	30%	40%	45%
83	89	94	**111**	133	144	155	161
84	90	95	**112**	134	146	157	162
85	90	96	**113**	136	147	158	164
86	91	97	**114**	137	148	160	165
86	92	98	**115**	138	150	161	167
87	93	99	**116**	139	151	162	168
88	94	99	**117**	140	152	164	170
89	94	100	**118**	142	153	165	171
89	95	101	**119**	143	155	167	173
90	96	102	**120**	144	156	168	174

Table No. 3—*Continued*

Underweight			Standard	Overweight			
25%	20%	15%		20%	30%	40%	45%
91	97	103	**121**	145	157	169	175
92	98	104	**122**	146	159	171	177
92	98	105	**123**	148	160	172	178
93	99	105	**124**	149	161	174	180
94	100	106	**125**	150	163	175	181
95	101	107	**126**	151	164	176	183
95	102	108	**127**	152	165	178	184
96	102	109	**128**	154	166	179	186
97	103	110	**129**	155	168	181	187
98	104	111	**130**	156	169	182	189
98	105	111	**131**	157	170	183	190
99	106	112	**132**	158	172	185	191
100	106	113	**133**	160	174	186	193
101	107	114	**134**	161	174	188	194
101	108	115	**135**	162	176	189	196
102	109	116	**136**	163	177	190	197
103	110	116	**137**	164	178	192	199
104	110	117	**138**	166	179	193	200
104	111	118	**139**	167	181	195	202
105	112	119	**140**	168	182	196	203
106	113	120	**141**	169	183	197	204
107	114	121	**142**	170	185	199	206
107	114	122	**143**	172	186	200	207
108	115	122	**144**	173	187	202	209
109	116	123	**145**	174	189	203	210
110	117	124	**146**	175	190	204	212
110	118	125	**147**	176	191	206	213
111	118	126	**148**	178	192	207	215
112	119	127	**149**	179	194	209	216
113	120	128	**150**	180	195	210	218
113	121	128	**151**	181	196	211	219
114	122	129	**152**	182	198	213	220
115	122	130	**153**	184	199	214	222
116	123	131	**154**	185	200	216	223
116	124	132	**155**	186	202	217	225
117	125	133	**156**	187	203	218	226
118	126	133	**157**	188	204	220	228
119	126	134	**158**	190	205	221	229
119	127	135	**159**	191	207	223	231
120	128	136	**160**	192	208	224	232
121	129	137	**161**	193	209	225	233
122	130	138	**162**	194	211	227	235
122	130	139	**163**	196	212	229	236
123	131	139	**164**	197	213	230	238
124	132	140	**165**	198	215	231	239
125	133	141	**166**	199	216	232	241
125	134	142	**167**	200	217	234	242
126	134	143	**168**	202	218	235	244
127	135	144	**169**	203	220	237	245
128	136	145	**170**	204	221	238	247
128	137	145	**171**	205	222	239	248
129	138	146	**172**	206	224	241	249
130	138	147	**173**	208	225	242	251
131	139	148	**174**	209	226	244	252
131	140	149	**175**	210	228	245	254
132	141	150	**176**	211	229	246	255
133	142	150	**177**	212	230	248	257
134	142	151	**178**	214	231	249	258
134	143	152	**179**	215	233	251	260

Table No. 3—*Continued*

Underweight			Standard	Overweight			
25%	20%	15%		20%	30%	40%	45%
135	144	153	**180**	216	234	252	261
136	145	154	**181**	217	235	253	262
137	146	155	**182**	218	237	255	264
137	146	156	**183**	220	238	256	265
138	147	156	**184**	221	239	258	267
139	148	157	**185**	222	241	259	268
140	149	158	**186**	223	242	260	270
140	150	159	**187**	224	243	262	271
141	150	160	**188**	226	244	263	273
142	151	161	**189**	227	246	265	274
143	152	162	**190**	228	247	266	276
143	153	162	**191**	229	248	267	277

The present day conception of the proper way to manage the diet of an obese person is to determine the normal weight for the height and age. This can be done by one of the numerous formulae or more conveniently by consulting the tables such as are used by the life insurance companies. The preceding table shows the weights for males and females. The female weights are slightly less than the male. This ideal weight if in kilograms is multiplied by 35 or if in pounds by 35 divided by 2.2. This will give the number of calories required for twenty-four hours by a patient about, but not at hard labor. If the individual is engaged in hard labor the multiplying number should be 40 or 45, according to the amount of exertion and the length of time it is engaged in. The first care is to provide for sufficient protein, which is necessary to the maintenance of the health and strength of the individual. Ordinarily this may be placed at about 100 grams for the average size individual and increased or decreased according to their size. This amount of protein will furnish 410 calories, which may be deducted from the figures as determined above. The remainder may be made up by properly balanced ration and the whole diet filled out by the use of bulky foods of low caloric value. In addition to the diet it should be remembered that the exercise of the individual should be increased and if necessary, in chosen cases the metabolism increased by the judicious use of thyroid extract. (See Below.)

The easiest way to apply a diet for obesity is to use the suggestion of Umber, who suggested giving the so called skeleton diet and then adding to this accessory articles, each portion furnishing 100 calories, these being added to bring up the diet to the proper number of calories. His diet as given by Barker, is as follows:

The following "skeleton diet" amounts to about 880 calories, containing 93.7 g. protein; this may be supplemented, according to the needs of the particular patient by an "accessory diet," consisting of given portions of foods, each "accessory portion" corresponding to a food value of 100 calories.

SKELETON DIET (= 880 CALORIES)

MORNING:—1 cup (250 c.c.) coffee or tea, with 1 tablespoonful (15 c.c.) milk; 1 small slice (50 g.) brown bread, or ½ slice (30 g.) white bread.
FORENOON:—1 small orange or 1 small apple, or similar amount of other fresh fruit.
NOON:—2 slices (250 g.) roast meat; 2 portions (200 g.) green vegetables boiled in salt water; a little fruit.
AFTERNOON:—½ cup (125 c.c.) coffee, with 1 tablespoonful (15 c.c.) milk.
EVENING:—One slice (100 g.) meat, or a little chicken or fish; 1 portion (100 g.) green vegetables; ½ slice brown bread (25 g.); 1 cup tea: (if desired).
At bed time:—a little raw fruit.

ACCESSORY DIET (EACH PORTION = 100 CALORIES)

80 g. roast beef; 200 g. oysters; 40 g. white bread, graham bread or rye bread; 20 g. Zwieback, 12½ g. butter; 20 g. Swiss cheese; 25 g. sugar; 100 g. potatoes; 30 g. rice, peas, beans, or buckwheat; 20 g. flour; 200 g. apples; 150 g. apple sauce; 500 g. cranberries; 150 g. milk; 150 g. wine; 30 g. brandy or whiskey.

Accessory Diet of Filling Foods of Low Caloric Value

100 g. cooked asparagus	= 43	calories
" " " green beans	= 20	"
" " " green peas	= 108	"
" " " tomatoes	= 20	"
" " " spinach	= 52	"
" " " turnips	= 40	"

In the front part of this volume will be found a table giving the size and the weight of the various foods in hundred calories portions. This will be found of great value in arranging obesity diets. The patient may be given a list containing the proper number of calories and expressed in the language which he can understand. There will also be found another table showing the value of common foods in household measures and one giving the caloric values of the common foods per ounces arranged in the order of their values. The ones at the beginning of the list may be used rather freely up to those which contain 20 calories per ounce, which are forbidden in most instances or are to be used in very small quantities, and interchanged for foods of smaller values. This may be done to furnish a variety in the diet, but these changes should be carefully considered in order to avoid giving the patient more than he should have.

The protein food may be given as eggs or meat and the remainder of the diet of filling foods of low caloric value are added, such as vegetable marrow, spinach, sea kale, onions, turnips, cabbage, Savoy cabbage, cauliflower, parsnips, beets, carrots, celery, cucumbers, radishes, asparagus, artichokes, green peas, Brussels sprouts, leeks, egg plant, squash, salsify, strawberries, pineapple, oranges, lemons, cranberries, raspberries, blackberries, apricots, apples and pears.

The patient should be instructed that there are certain foods that are strictly forbidden. In the first place the fatty foods should be cut out of the diet. These include bacon and fat of any meat, pork, on account of its containing so much fat, olive oil, butter and cream. Secondly, the foods rich in carbohydrates. These include sugar, bread, biscuit, crackers, all sorts of breadstuffs, and all sorts of

cereals and breakfast foods and all sorts of candies, sweets, ice cream, cakes and sweet desserts as well as rice and macaroni and corn and dried beans and lentils and potatoes. Milk and cheese are generally forbidden, but skim milk or whey or buttermilk may be allowed. Wines and malt liquors and spirits of all kinds are strictly forbidden.

Starvation Diet.—Folin and Denis have studied some cases of unusually fat patients and suggest that an effective, and, at the same time, rapid and safe method of reducing the weight under these conditions is by a series of repeated fasts. They found that after about four days acetone bodies began to be greatly increased in the urine and the acidosis was relieved by interrupting the fasting and placing the patient on a diet just sufficient to cause the disappearance of the acetone bodies from the urine. The fasting was then started again and interrupted when the acidosis began to make itself manifest. With each successive period of starvation the onset of the acidosis was more and more delayed. By checking up the condition of the patient by studying the acetone bodies and the ammonium nitrogen in the urine they believe that this method of reduction will be found very valuable.

Oertel's Method.—Oertel makes the following suggestions as to the treatment of the various classes of obesity, always considering whether the patient is plethoric or anemic:

"(*a*) Where there is an abnormally increased amount of fat in plethoric patients with unimpaired or only beginning changes in the heart action the diet should aim at—

"(1) An increased supply of protein.

"(2) A decrease in the fat-producing substances.

"(3) Little or no diminution in the supply of liquids below the physiologic amount (1500 c.c.—3 pints).

"(*b*) Where there is obesity in anemic patients, viz., serous plethora, the diet should aim at—

"(1) An increase in the quantity of proteins.

"(2) A diminution in the amount of fat-forming substances, and eventually—

"(3) A decrease in the amount of fluid.

"(*c*) Where there is obesity in adults with hydremic symptoms, in whom not only the amount of protein, but also the abnormally increased amount of fat is slowly wasting away, they require—

"(1) An increase in the amount of protein taken.

"(2) A sufficient amount of fat and carbohydrates or even an increase of same to prevent the falling off of fat.

"(3) A diminution in the amount of fluid taken."

Oertel lays particular stress on the fact that dietetic rules should be based upon changes in the heart, and consequently of the circulation. Both the quality and the quantity of food and drink should be considered. If the circulation is disturbed, small excesses, either in

food or in drink, will give rise to distress. The most noticeable symptoms are a feeling of oppression, palpitation of the heart, and difficulty in breathing. In pronounced cases of disturbances of the circulation, if too hearty a meal has been indulged in, death may follow slight exertion. In these cases death is due to paralysis of the heart. The effect of the meals on the circulation must be observed carefully, the amount of disturbance following a meal will determine the size and the number of meals that must be taken.

The aim of the treatment is to furnish food and exercise in such amounts that the body fat may be burnt up and thus the needed reduction of weight take place, while at the same time the body and heart are strengthened. This can be done only by a careful study of each case. In a word, the physician must discriminate between those cases in which the respiratory and circulatory apparatus have not been disturbed, and where the muscular apparatus is in such condition that a considerable amount of bodily exercise may still be taken, and those cases in which the blood is poor, where advanced venous stasis reduces the absorption of oxygen in the lungs to a minimum, and where slight muscular exertion exhausts the oxygen, interferes with respiration, and gives rise to dyspneic symptoms. In the first class a liberal amount of fat and carbohydrates may be allowed—that is, as large a quantity as the patient can dispose of in his body by exercise without defeating the objects of the treatment. In the second class the fats and carbohydrates and the quantity of fluid taken must be reduced to a minimum.

The foods given must be such as will supply the proper amount of nourishment without forming fat. The following are equivalent in heat and force production, or, in other words, they are said to have the same caloric value: 100 grams of fat, 211 grams of protein, 232 grams of starch, 234 grams of cane-sugar, 256 grams of grape-sugar (240 grams as a sugar average). To make this more clear it must be remembered that a body stores up fat if more than 118 grams of protein and 259 grams of fat, with a caloric value of 2894, are taken; but 110 grams of protein and 600 grams of starch, with a caloric value of 2944, may be given without producing fat. With a mixed diet the limit lies near 118 grams of protein, 100 grams of fat, and 368 grams of starch, a total of 586 grams, or of 2923 calories. The simplest way to reduce the fat-forming elements is to diminish the fat and allow a certain amount of carbohydrates. The diet must be regulated according to the individual case—this is a point that can not be too strongly insisted upon. Oertel gives the following figures, based on numerous calculations:

	Protein Grams.	Fat Grams.	Carbo-hydrates Grams.	Calories.
Minimum	156	25	75	1180
Maximum	170	45	120	1608

The amount of material burnt in the body may reach from 2500 to 3500 calories, and the difference between that supplied by the food and the total amount used is taken from the fat stored up in the body, and the patient loses weight accordingly.

Oertel lays particular stress on limiting the amount of fluid taken. He regards 1500 c.c. as the physiologic limit, and allows more than this—from 1800 to 2000 c.c.—only in very tall patients or when there is fever. In still other cases he reduces the amount to from 750 to 1200 c.c.

The solid food is to be taken in several small meals, and the liquids are to be taken only in the intervals between meals. Soups are not permitted. Five or six meals are given a day, their frequency obviating the necessity for eating very large meals.

If the patient is anemic, the breakfast should be of sufficient size, but should not include either tea or coffee.

Oertel regards exercise as of as much importance as diet. In the average case he advises from four to five hours' outdoor exercise daily, taken in the morning and afternoon. If the patient can not take that much—and he rarely can at first—he is given exercises of increasing length and severity until the required amount is reached. The increase should be made gradually, and should depend entirely on the patient's condition. He should be told the distance he is to walk, and not the time in which he is to do it, for if the latter is done, a lazy patient may do much less than is necessary, whereas the energetic or ambitious patient may overexert himself.

Oertel insists on the exercise being taken in the open air and on the careful regulation of the amount by the physician. Where it is possible, as it is at some of the Continental resorts, the paths should be of four different grades. These are as follows:

First	the incline from 0 to 5 degrees
Second	the incline from 5 to 10 degrees
Third	the incline from 10 to 15 degrees
Fourth	the incline from 15 to 20 degrees

A pedometer may be used to measure the amount of walking done, and furnishes a convenient means of prescribing walking exercises. Care should be taken to use only a reliable instrument, for some are very inaccurate. The amount of exercise is regulated according to the state of the patient's heart, his general strength and condition, and also as to whether he is plethoric or anemic. Any complications that exist must also be taken into account.

If the patient is plethoric and the heart is in good condition, he may be ordered to take walks of the first and second grades at the outset, the distance prescribed being about that which an ordinary individual would walk in from one and one-half to two hours. This amount should be divided up between the morning and afternoon, as circumstances may warrant. The return course is not taken into

account. The patient should be allowed to consume as much time as he requires in walking this distance. Care should be taken to avoid overexertion. Days of rest may be interspersed as the need for them arises. The distance may be lessened or increased, according to the case. The patient should use the paths of the fourth grade only when the heart has become strong and when he is in good condition, and then only occasionally.

The patient should be taught to breathe deeply and regularly. Ordinarily, if he gets out of breath easily, he may be allowed an inspiration and an expiration for each step. When using the paths of the second and third grades, the patient may from time to time, for short intervals, breathe in an interrupted (staccato) manner, taking one inspiration for two steps and then two expirations within the next two steps. This method is often of great value in securing perfect inspiration and expiration.

If the patient is anemic or hydremic, or if the heart action is impaired, the exercises should be begun on level ground and gradually increased in severity. Several weeks or more, according to the case, should be allowed to elapse before the patient is permitted to try the third grade paths.

In patients with sclerosis and atheroma exercises must be prescribed with extreme caution. If the sclerosis is not marked, the patient may derive the greatest benefit from the exercises, but the amount and the variety should be cautiously prescribed and their effect watched. If atheroma is present, the greatest care should be taken to guard against overexertion. In all these cases, however, exercises should not be entirely dispensed with, although the amount may be limited to the minimum.

If there is involvement of the coronary arteries, whether or not stenocardic attacks have taken place, only the smallest amounts of exercise should be allowed, and these should be on level ground. It is only in rare cases that this amount should be dispensed with, for if the patient remains at rest and the fatty condition be allowed to progress, the patient must inevitably become very weak.

Exercise is contraindicated in myocarditis, pronounced albuminuria, and general edema. When any of these are present, rest and proper medication are to be advised.

Diet After the Treatment.—The following is Oertel's general diet, which is to be modified to suit the individual case.

"*Morning:* A cup of coffee or tea with milk (150 to 200 c.c.—5 to 6 ounces) and bread, 75 grams (2½ ounces).

"*Forenoon:* In cases preceding anemia and hydremia, one or two soft-boiled eggs or 30 to 40 grams (one to one and one-half ounces) of meat, cold or freshly broiled, 100 c.c. (3 ounces) of wine, or in conditions of weakness 50 c.c. (1½ ounces) port, and a small quantity of bread.

Table I.—Oertel's Special Diet-list in Circulatory Disturbances and Obesity.[1]

Liquids taken.	Quantity in grams and centigrams.	Water contained.	Protein.	Fat.	Carbohydrates in grams.	Analysis after—
Morning, 7–8 o'clock:			*Caffein.*			
Coffee	120	113.6	0.21	0.62	1.7	König.
Milk	80	26.2	1.29	0.96	1.2	"
Morning, 10–11 o'clock:						
Port wine	50	38.7	0.80	. .	3.0	König.
Or Pfälzer wine . .	100	86.1	. .	. .	2.4	"
Or clear soup . . .	100	99.1	. .	0.80	. .	Reuk.
Noon, 1 o'clock:						
Wine (Pfälzer) . . .	200	172.2	. .	. .	4.8	König.
Water						
Afternoon, 4 o'clock:						
Coffee	80	75.6	0.12	0.40	1.1	König.
Milk	20	17.5	0.70	0.70	0.9	"
Evening, after 7 o'clock:						
Wine (Pfälzer) . . .	200	172.2	. .	. .	4.8	"
Or water	250	215.3	. .	. .	7.2	"
Total	750	616.0	3.12	2.68	17.5	

Total that should be taken in twenty-four hours . . { Water . . . . . 973.0 grams. Protein . . . . 157.6 " Fat . . . . . . 26.3 " Carbohydrates 72.8 "

Food taken.	Quantity in grams.	Water contained.	Protein.	Fat.	Carbohydrates in grams.	Analysis after—
Morning:						
Fine wheat bread	25	8.9	1.80	0.10	14.6	König.
Two soft-boiled eggs . .	90	66.2	11.20	10.80	0.4	"
Boiled meat	50–100	29.0	19.10	0.80	. .	v. Voit.
Sugar (saccharin)	5	0.1	0.02	. .	4.8	König.
Morning, 10 o'clock:						
Cold meat . . . . } Lean ham . . . . }	50	29.5	19.10	0.90	. .	v. Voit.
Rye bread	20	8.4	1.20	0.08	9.8	König.
Noon:						
Soup	0–100	91.6	1.10	1.50	5.7	{ Ave'ge of 10 different soups (Reuk).
Roast beef	150	87.5	57.30	2.60	. .	v. Voit.
Beef boiled with fat . . .	150	85 2	51.50	11.20	4.2	König.
Salad (green)	25	23.5	0.30	1.00	0.5	"
Vegetables (like cabbage)	50	35.5	0.80	0.20	4.2	v. Voit.
Desserts	100	45.0	8.70	15 00	28.9	{ Average of 7, according to Reuk.
Rye bread	20	8.4	1.20	0.08	9.8	König.
Fruit	100	85.0	0.30	. .	15.0	v. Voit.
Afternoon:						
Sugar (saccharin)	5	0.1	0.02	. .	4.8	König.
Evening:						
Two soft-boiled eggs . . .	90	66.2	11.20	10.80	0.4	König.
Roast meat (lean)	150	87.5	57.30	2.60	. .	v. Voit.
Salad	25	23.5	0.30	1.00	0.5	König.
Rye bread	20	8.4	1.20	0.80	9.8	"
Cheese	15	5 4	3.60	4.50	0.6	"
Fruit	100	85.0	3.00	. .	15.0	v. Voit.
Total	700	357.0	154.50	23.74	56.3	

[1] From *Twentieth Century Practice*, p. 701.

"*Noon:* 100 c.c. soup; 150 to 200 grams (5 to 6 ounces) meat of various kinds, boiled or broiled beef, veal, game, or fowl, not too fat; salad or easily digested vegetables at discretion; likewise fish cooked

Table II.—Oertel's Diet-list in Circulatory Disturbances and Obesity.[1]

Liquids taken.	Quantity in grams and centigrams.	Water contained.	Protein.	Fat.	Carbo-hydrates in grams.	Analysis after—
Morning, 7–8 o'clock:						
Coffee	120	113.6	0 21	0.62	1.7	König.
Milk	30	26.2	1.29	0.96	1.2	"
Morning, 10–11 o'clock:						
Wine (Pfälzer) . . .	100	86.1	. .	. .	2.4	König.
Or clear soup . . .	100	99.1	. .	0.80	. .	Reuk.
Water	100	100.0				
Port wine	50	38.7	0.80	. .	3.0	König.
Noon, 1 o'clock:						
Wine (Pfälzer) . . .	250	215.3	. .	. .	7.2	König.
Afternoon, 4 o'clock:						
Coffee	120	113.6	6.21	0.62	1.7	König.
Milk	30	26.2	1.29	0.96	1.2	"
Evening, after 7 o'clock:						
Wine (Pfälzer) . . .	250	215.3	. .	. .	7.2	"
Water at discret'n	100 150	100.0 150.0				
Total	1000	896.3	3.00	3.16	22.6	
Quantity to be taken in 24 hours . . .	. .	1413.8	169	42.5	117.5	

Food taken.	Quantity in grams.	Water contained.	Protein.	Fat.	Carbo-hydrates in grams.	Analysis after—
Morning:						
Fine wheat bread . . .	35– 70	12.4 24.9	2.40 4.90	0.20 0.40	19.60 39.20	König.
Two soft-boiled eggs . . .	90	66.2	11.20	10.80	0.40	"
Roast meat	100	58.0	38.20	1.70	. .	v. Voit.
Sugar (saccharin)	5	0.1	0.02	. .	4.80	König.
Butter	12	1.7	0.08	9 90	0.06	
Morning, 10–11 o'clock:						
Cold meat . . . . Lean ham	50	29.5	19.10	0.90	. .	v. Voit.
Rye bread	20	8.4	1.20	0.08	9.80	
Noon:						
Soup	0–100	91.6	1.10	1.50	5.70	Av'e 10 soups (Reuk).
Fish	100	74.7	22.10	0.60	0.70	Boiled in water, loss
Vinegar added	25	23.5		. .	0.10	water 18 p. c. (König).
Roast-beef	150– 200	87.5 116.0	57.30 76.40	2.70 3.40	. . . .	v. Voit.
Beef (fat) boiled	200	113.0	68.30	15.00	0.80	König.
Salad (green)	50	47.1	0.70	1.00	1.10	"
Vegetables (cabbage, etc.)	50	35.5	0.80	0.20	4.20	v. Voit.
Desserts	100	45.0	8.70	15.00	28.90	Av'e 7 des'rts (Reuk).
Bread (roll)	25	7.0	2 40	10.20	15 00	Reuk.
Fruit.	100	85.0	0.30	. .	15.00	v. Voit.
Afternoon:						
Sugar	5	0.1	0.02	. .	4.80	König.
Evening:						
Caviare	12	6 4	3.00	1.50	. .	König.
Kieler sprotten	16	9.4	3.60	2.40	0.14	"
Salmon (smoked)	18	9·2	4.30	2.10	0.07	"
Two soft-boiled eggs . . .	90	66.2	11.20	10.80	0.04	"
Game or fowl . . . . . Beef-steak	150	87.5	57.30	2.70	. .	v. Voit.
Cheese	15	5.4	3.60	4.50	0.60	
Rye bread	20	8.4	1.20	0.08	9.80	
Fruit.	100	85.0	3.00	. .	15 00	v. Voit.
Total	852	517.5	166.10	39.40	94.80	

[1] From *Twentieth Century Practice*, p. 702.

without much grease; 25 grams (about 1 ounce) bread or some farinaceous food—at most, 100 grams (3 ounces); for dessert, fruit, 100 to 200 grams (3 to 6 ounces), best fresh or preserved (especially

after Nageli's method). For drink, one-sixth to one-fourth of a liter (6 to 8 ounces) of light wine or beer; water.

"*Afternoon:* Again, 150 to 200 c.c. (5 to 6 ounces) of coffee or tea, with about one-fourth of a liter of water (one-half pint) and 25 to 50 grams (1 to 2 ounces) of bread if there is any desire for it.

"*Evening:* Meat as at noon, or eggs, 25 grams (about 1 ounce) of bread, and possibly a small amount of cheese, salad, or fruit. Beverage, wine, with or without water, or beer, best taken some time after the meal—up to 300 to 500 c.c. (½ to 1 pint). Delicacies, oysters, caviare, etc., by reason of their nourishing qualities, may be eaten between or before meals, but so that they do not too much augment the total quantity of food." (See Tables I. and II., pages 711 and 712

DIET FOR LEANNESS

It is much easier to reduce a patient who is obese than to fatten one who is thin. The measure of success is largely dependent on the cause of the leanness. About one-half of all thin persons are so from hereditary causes, and time and energy are almost wasted in an attempt to fatten these. When there is a definite cause for the emaciation and this can be discovered and removed, much can be accomplished. In these cases relief from worry, bustle, and excitement may be all that is necessary. More often there is starch dyspepsia, or the patient may be unable to take sugar without inducing fermentation and flatulence.

In a general way, the following suggestions for the relief of leanness may be made: The patient should lead a quiet, out-of-door life, free from care and excitement, and should get sufficient sleep. The meals should be ample, and as much carbohydrate and fatty food should be taken as is possible. Cream, milk and cream, butter, cocoa, and chocolate, bread, cereals (well cooked), farinaceous puddings, potatoes, legumes, and sweet fruits should all be partaken of in abundance. All sweets—honey, syrups, cakes, and the like—may be taken if they agree with the digestion. Beer, especially of the darker varieties, brown stout, porter, and ale are useful. If wine is preferred, sweet wines or port should be chosen. If alcohol is contraindicated, malt extracts may be given.

The patient should avoid strong alcoholic liquors, acids, spices, and the like, as well as many green vegetables. In a word, the diet should be the reverse of that recommended for obesity. (See Rest Cure.)

THE DEFICIENCY DISEASES.—VITAMINS

Vitamins—Accessory Food Factors.—It is indeed strange that with a practical knowledge of some of the so-called deficiency diseases that nothing was done until recently toward a scientific study of this subject. Lind states that Cartier on his voyage to Newfoundland cured

scurvy by giving a decoction of pine needles. The use of fresh fruits and vegetables in the prevention and cure of scurvy was known years ago, and in 1720 Kramer wrote about it in his work on camp medicine.

Rickets it was found could be prevented and cured by proper diet and the use of cod-liver oil, and Kassowitz suggested the addition of phosphorus.

Beriberi was such a factor in invaliding the sailors of the Japanese Navy that in 1885 Takagi Kanehiro, studying the disease, concluded that there was some intimate connection with the diet, and succeeded in having the ration changed, barley was substituted in part in place of the polished rice. The disease soon disappeared.

In 1897 Eijkman produced a polyneuritis in pigeons fed polished rice, and also noted that beriberi developed on a diet of polished rice, and that it could be prevented or cured by using unpolished rice.

In 1901 Grijns cured the experimental polyneuritis of fowls by adding beans to the diet.

Röhman in 1902 found that mice fed on purified food materials were difficult to raise and could not bring forth living young.

In 1906 Hopkins called attention to the fact that there were ''accessory factors'' in the diet in addition to the protein, fat, carbohydrate, and salts that played an important part in the nutrition, and an absence or deficiency of these factors produced diseased conditions. Funk in 1912 suggested the term ''vitamins,'' and it has been adopted generally on account of its simplicity, although there is no evidence to show that the substances are amins, and McCollum has suggested that as the substances necessary for growth are soluble in fat or water, the terms ''fat-soluble A,'' and ''water-soluble B'' be used, and many writers and investigators have used these terms. Others have used the terms ''Vitamin A,'' for the ''fat-soluble A'' of McCollum; ''Vitamin B'' instead of ''water-soluble B,'' and to these have been added ''Vitamin C,'' the antiscurvy factor, and some suggest as ''Vitamin D'' a calcium-depositing factor about which there is still discord. Among the notable investigators in addition to those mentioned above are Mendel, Osborne, Chick, McGarrison, to mention but a few. The number of workers and contributions are so great that for further details the reader is referred to such works as Sherman and Smith's ''The Vitamins,'' Ellis and McLeod's ''Vital Factors of Foods,'' Funk's ''The Vitamins,'' and McCollum's ''Newer Knowledge of Nutrition.'' Merely the essential facts can be stated here and the practical diets used in the prevention and cure of the deficiency diseases.

How and why vitamins act is still not understood. Some think that the action is direct, either as a catalyzer on toxic products or as food for the cells. Others believe that the action is through the endocrine glands. Vitamins cannot be synthetized by the body from basal foodstuffs, and probably cannot be stored in the body for future use.

Vitamin A—Fat-soluble A.—The history of the discovery of this

vitamin is intimately connected with that of experimental nutritional studies in animals, which would be out of place here, but which is given in detail in McCollum's "Newer Knowledge of Nutrition" and elsewhere. Our knowledge is due to a host of workers, of which Stepp, Osborne and Mendel, Hopkins, and McCollum and his co-workers were the path-finders. They found that experimental animals would not grow unless this indispensable substance was present in the food, and if the lack continued definite pathologic changes ensued.

There are considerable differences in the statements about fat-soluble A, but this is rapidly being overcome. It is found in certain animal fats, and then it is soluble in fat, in fat solvents, and slightly in alcohol. This vitamin is also present in various vegetables (see Table) and may be extracted by the use of alcohol followed by ether. These extracts fed to animals living on a diet deficient in Vitamin A induced growth.

In animal fats this vitamin resists heat fairly well unless there is opportunity for oxidation to take place, when it is rapidly destroyed. This vitamin in plants resists heating, drying, and oxidation better than when in animal fats, but further studies are necessary to determine how much the vitamin is affected by the action of these processes in the various plants.

Vitamin A may be stored in the body for future use, an important point, as animals who have been receiving a sufficiency may continue to grow in spite of the fact that their diet may have been changed to one containing an insufficient amount of the vitamin. There comes a time, however, when the supply is exhausted, and then the nutritional disturbance becomes manifest. This should always be borne in mind in infant feeding. A false sense of security may be engendered by the gain in weight, when, in reality, there is a latent nutritional disturbance of primary importance. Another point in connection with infant feeding is that colostrum is very high in Vitamin A, and it has been suggested that this is a sort of reserve supply intended to stimulate the nutrition of the child, and that every effort should be made to see that the child receives this valuable food material. Vitamin A occurs in skimmed milk, but not in anything like the amount found in whole milk.

The functioning parts of plants contain more than the storage part. Thus there is more in the embryo and the leafy part than in starchy part.

Vitamin A is found in small or moderate amounts in most cereals and grains, but note that it is absent in polished rice, in white maize, and white flour. There is none in sugars or starches.

Large amounts are found in butter, cream, cod-liver oil, and small amounts in some other animal fats. It is absent in cocoanut, olive, and peanut oil. Small amounts are found in fresh meats, the muscle parts, and moderate amounts in liver and kidney.

But few fruits contain it in more than in questionable amounts;

there is some in apples and orange juice and moderate amounts in raw and canned tomatoes. From the standpoint of vitamins the tomato seems to be the best fruit there is—a very valuable adjunct to the diet.

Fresh string beans, green cabbage, carrots, chard, dandelion greens, lettuce, peas, sweet potatoes, and Hubbard squash all contain moderate amounts; spinach contains large amounts, while white potatoes, endive, soy beans, cauliflower, and white cabbage have but small amounts. Small amounts are found in almonds, cocoanuts, and peanuts. Milk is a most important source of Vitamin A, and large amounts are contained in whole milk, condensed, evaporated, and properly dried milk, moderate amounts occur in cheese, and small amounts in skimmed milk and cottage cheese. It is questionable whether it occurs in egg-white, but the yolk contains large amounts. There is none in yeast.

No diet can be considered a proper one which does not contain a sufficient amount of the foods mentioned, which contain large or moderate amounts.

Vitamin B—Water-soluble B.—This vitamin is soluble in water and alcohol and is dialyzable. Vitamin B resists the action of heat and oxidation better than either A or C, and while it is more stable in acid solutions than in alkaline, it is not as quickly affected by alkalies as C.

It is the most stable of the vitamins known at present. In ordinary cooking Vitamin B is not much changed by the heat, but the exact effects on this vitamin of sterilizing and canning various foods has yet to be definitely determined. It is present in sufficient quantities in dried, sterilized milk when these processes are carried out rapidly; it is also apparently but little affected by the canning processes as applied to the tomato. The losses in cooking are largely due to the losses from its dissolving out in the water, so that when it is desired to preserve the vitamin action of foods the water used in cooking should not be thrown away, but utilized as food.

The occurrence of Vitamin B in food-stuffs is important. It is absent in the various sugars, with the exception of a small amount in honey; also fats, with a possible question of a small amount in cod-liver oil; in grains and cereal products it varies, but is present in moderate amounts in most, less so in sprouting grains and malts. Grijns observed that when seeds sprouted the antineuritic vitamin seemed to disappear and the antiscurvy vitamin seemed to replace it. In brain, kidney, liver, and other glands it is present in medium amounts, slight in canned meats, little in muscles, little in fish except in fish roe. Some fruits have it in abundance, as tomatoes fresh or canned; the citrus fruits have moderate amounts except the lime; apples, pears, and prunes have small amounts. Large amounts are found in beans, raw cabbage, fresh spinach, and yeast, and medium amounts in string beans, cooked or dried, cabbage, carrots, cauliflower egg-plant, lettuce, onions, peas, white potato boiled or baked, turnips, almost all

the edible nuts. It occurs sparingly in egg yolk. In milk it is present in whole fresh condensed, dried and skimmed milk, buttermilk, and cheese. It varies in milk according to the nature of the food, and this is true of this vitamin in human milk; it seems to vary directly as the Vitamin B content in the mother's food.

There is some difference of opinion concerning the nature of Vitamin B. There are a considerable number of reasons why it is identical with the growth-producing water-soluble substance described by Hopkins, Osborne and Mendel, and McCollum, but there are also a considerable number of reasons for supposing that, while the two are for the most part found in about the same amounts in the various foods, with some exceptions, that the two are not identical, particularly in the view of what follows a deficiency. For the present, as Sherman and Smith point out, it will be just as well to consider Vitamin B as including the antineuritic vitamin of Eijkman, Grijns, Funk, and others, whose lack makes for beriberi in man and a similar condition in mammals and polyneuritis in fowls, and the water-soluble B of the observers mentioned above, which when lacking in the diet leads to loss of appetite, lack of growth, and eventually a condition similar to beriberi. This is supposed to be in some way connected with the lymphatic system, and there is a diminution of the lymphocytes which have something to do with cell nutrition. For practical dietetics they are assumed to be the same, at least at present.

Vitamin C—Water-soluble C.—This is soluble in water and in alcohol, will pass through a dialyzer and a porcelain filter. It differs from Vitamin B in that it is not absorbed by fine precipitates such as fuller's earth. It is easily weakened and destroyed by heat, but this is dependent on many other factors; whether moist or dry and the reaction; less change is noted in acid solutions, and so on. Short periods of heat, as high as boiling, are borne better than longer exposures at a lower temperature. For example, take the well-known fact that scurvy is much more easily produced by milk pasteurized for thirty or forty-five minutes than by milk which has been boiled a few minutes. In a like manner this vitamin is affected by drying, but here again the action is qualified by other factors. Dried milk, made either by the Hatmaker or Merrell-Gere processes, retains most of the vitamin. It must also be noted that in properly dried food Vitamin C resists aging better than in moist ones. Aging affects it less in an acid medium than in an alkaline one.

As pointed out above, the fact that scurvy could be prevented or cured by certain fresh or specially preserved foods was known for a long time. At that time man was the only animal known to have scurvy. Theobald Smith in 1895 observed a hemorrhagic disease in guinea-pigs fed on oats, and in 1907 and subsequently this disease was identified as scurvy by Holst and Fröhlich. The monkey is also susceptible to scurvy. Vitamin C cannot be stored in the body for future use, as is possible to some extent with Vitamin A.

The distribution of this vitamin in foods is shown in the table and given in the article on Scurvy.

The Calcium-depositing Vitamin—Vitamin D.—Mellanby, McCollum and his associates, and others have pointed out that there are in cod-liver oil two vitamins or what amounts to that. If cod-liver oil is oxidized for twelve to twenty hours it does not cure xerophthalmia of rats, but it will cause calcium to be deposited in the bones of young rats with rickets. Cocoanut oil will not prevent or cure xerophthalmia, but it will stimulate calcium deposition much like cod-liver oil, but much less effectively.

Cod-liver oil, shark-liver oil, and turbot-liver oil contain in large quantities the substance protecting from and curing *(i. e.,* Vitamin A) xerophthalmia and the calcium-depositing vitamin. On the other hand, various vegetable oils from maize, olives, sesame, and cottonseed do not protect from or cure xerophthalmia nor cause calcium deposition.

Butter fat contains Vitamin A, but the calcium-depositing vitamin, while present, is in much smaller quantities than in fish liver oils. (See Rickets.)

The amount of vitamins in various foods is sometimes expressed in the amount of the particular food substance needed to prevent polyneuritis or to induce growth, but a simpler and, in the absence of accurate information, a much better plan is to indicate the relative amounts by from one to three plus marks, as in the accompanying table:

Distribution of Vitamins in Investigated Food Materials

(Table reprinted from Sherman and Smith, "The Vitamins," the Chemical Catalogue Co.; arranged from the report of the British Medical Research Committee.)

+ indicates that the food contains the vitamin.
++ indicates that the food is a good source of the vitamin.
+++ indicates that the food is an excellent source of the vitamin.
— indicates that the food contains no appreciable amount of the vitamin.
? indicates doubt as to presence or relative amount.
* indicates that evidence is lacking or appears insufficient.

Source.	A.	B.	C.
Grain products:			
Barley, whole	+	++	—
Bread, white (water)	?	+	—
(milk)	+	+	?
whole wheat (water)	+	++	?
(milk)	++	++	?
Corn (maize), white	—	++	—
yellow	+	++	—
Cottonseed meal	+	++	*
Flour, white	—	+	—
Grains, sprouted	+	++?	++
Malt, green	+	++?	++
Millet	++	++	*
Oats	+	++	—
Rice, polished	—	—	—
whole grain	+	++	—

Source.	A.	B.	C.
Grain products:			
Rye, whole	+	++	—
Wheat embryo	++	++?	—
endosperm	—	+	—
middlings, commercial	*	+++	—
bran	+	++?	—
whole	+	++	—
Sugars and Starches:			
Glucose	—	—	—
Honey	—	+	—
Starch	—	—	—
Sugar	—	—	—
Fats and Oils:			
Beef fat	+	—	—
Butter	+++	—	—
Cocoanut oil	—	—	—
Cod-liver oil	+++	—?	—
Corn oil	+?	—	—
Cottonseed oil	+?	—	—
Horse fat	+	—	—
Lard	+?	—	—
Linseed oil	—	—	—
Margarine, nut	—	—	—
oleo	+	—	—
Mutton fat	+	—	—
Olive oil	—	—	—
Oleo oil	+	—	—
Orange peel oil	++	*	*
Palm oil	+	—	—
Peanut oil	—	—	—
Pig kidney fat	++	—	—
Whale oil	++	*	—
Meats and Fish:			
Brains	+	++	+?
Fish, lean	—	+	*
fat	+	+	*
Heart	+	+	+?
Kidney	++	++	+?
Liver	++	++	+
Meat (muscle)	—to+	+?	+?
(extract)	—	—?	—
canned	—	slight	—
Roe, fish	+	++	+?
Sweetbreads	+	+	*
Fruits:			
Apples	+	+	+
Bananas	+?	+?	+
Cloudberries	*	*	+++
canned	*	*	+++
Cocum (dried)	*	*	+
Grape juice	*	+	+
Grape-fruit	*	++	++
Lemon juice	*	++	+++
dried	*	++	+++
Limes	*	+	+
Mango	*	*	+
Mulberries	*	*	+
Orange juice	—	—+	+++
peel	—	—	++
Pears	*	—	*
Prunes	*	+	—
Raspberries	*	*	+++
canned	*	*	+++

Source.	A.	B.	C.
Fruits:			
Tamarind, dried	*	*	+
Tomatoes, raw	++	+++	+++
canned	++	+++	+++
dried	++	+++	++
Vegetables:			
Alfalfa	+++	+++	*
Beans, kidney	*	+++	*
navy	*	+++	—
soy	+	+++	—
sprouted	*	*	++
string, fresh	++	++	++
Beets	*	+	*
Cabbage, fresh raw	+	+++	+++
cooked	+	++	++
dried	+	++	+
green	++	++	+++
Carrots, fresh raw	++	++	++
cooked	++	+	+
Cauliflower	+	++	+
Celery	*	+	*
Cress	*	*	+
Chard	++	+	*
Cucumber	*	+	*
Dandelion greens	++	++	+
Dasheens	—?	+	+
Eggplant (dried)	*	++	*
Endive	+	*	+
Legumes, sprouted	*	*	++
Lettuce	++	++	+++
Onions	*	++	++
Parsnips	—?	++	*
Peas	++	++	+?
sprouted	*	*	++
Potatoes, sweet	++	+	*
white, raw	+	++	++
white, boiled (15 minutes)	*	++	++
white, boiled (one hour)	*	++	+
white, baked	*	++	+
Radish	*	+	*
Rhubarb	*	*	+
Rutabaga	—?	++	+++?
Sauerkraut	*	*	—?
Spinach, fresh	+++	+++	*
dried	+++	++	*
Squash, Hubbard	++	*	*
Swede	*	++	+++?
Turnips	—?	++	*
Nuts:			
Almonds	+	+	*
Brazil nuts	—?	++	*
Chestnut	*	+	*
Cocoanut	+	++	*
press cake	+	++	*
Filberts	*	++	*
Hickory nuts	*	++	*
Peanuts	+	++	*
Pecans	*	++	*
Pine nuts	+	+	*
Walnuts, black	*	++	*
English	*	++	*

Source.	A.	B.	C.
Milk:			
Milk	+++	++	+ variable
condensed	+++	++	+ variable
evaporated	+++	++	—?
dried, whole	+++	++	+ variable
skim	+	++	+ variable
skimmed	+	++	+ variable
Dairy products:			
Butter	+++	—	—
Buttermilk	+	++	+ variable
Cream	+++	++	+ variable
Cheese	++	*	*
Cottage cheese	+	*	*
Eggs:			
Eggs	++	+	+?
Egg-white	*	*	*
Egg yolk	+++	+	*
Yeast:			
Yeast	—	+++	—
extract	—	+++	—

Xerophthalmia—Keratomalacia. Vitamin A Deficiency.—Animals or human beings when fed on diets which are deficient in Vitamin A develop a dryness of the cornea which is followed by ulceration, and eventually, unless the diet is changed, by loss of the eye. These changes were noted in the latter half of the eighteenth century in the South, where slave owners were trying to feed their slaves as cheaply as possible. They found that an exclusive diet of white rice caused dropsy and sore eyes, beriberi, and xerophthalmia. This disease was described in children in 1904 by Mori, in Japan, and in summer the disease was accompanied by diarrhea. There is also dryness of the skin, emaciation, and generally some other deficiency disease, as scurvy. He also noted that cod-liver oil, chicken livers, and eel fat cured the disease if given sufficiently early.

Hemeralopia, inability to see in subdued light, and nyctalopia, night blindness, are also believed to be due to a deficiency of Vitamin A, and there are records of cure on changing the diet.

Diets deficient in Vitamin A cause, or are supposed to cause, in addition to the tendency to eye diseases, a diminished appetite, diarrhea, susceptibility to infectious diseases, bronchial and lung diseases, and abnormalities of the skin.

A general antideficiency diet, either for prevention or cure must contain first, fresh food, neither too old nor sterilized by heat; it must contain foods known to be rich in vitamins; and lastly, it should contain fresh animal fats, preferably butter. Such a diet would include fresh fruit and fresh vegetables; fresh meats; and legumes fresh or dried (not canned), peas and beans or lentils; flours made by under milling the grains or whole grain flour.

Diets which are liable to produce deficiency diseases are those composed of preserved foods, such as salt meats, old dried vegetables or

TABLE SHOWING AFFINITIES AND PATHOLOGIC FEATURES OF SCURVY, BERIBERI, ETC.

Bone lesions at epiphyses of long bones	Rickets	Infantile scurvy	*	Guinea-pig scurvy				
Bone lesion at junction of ribs and cartilage	Rickets	Infantile scurvy	Scurvy	Guinea-pig scurvy				
Subperiosteal hemorrhages		Infantile scurvy	Scurvy	Guinea-pig scurvy				
Joint, subserous, subcutaneous and muscle hemorrhages		Infantile scurvy	Scurvy	Guinea-pig scurvy	Ship beriberi			
Spongy gums		Infantile scurvy	Scurvy	Guinea-pig scurvy	Ship beriberi			Pellagra
Dropsy			Scurvy	Guinea-pig scurvy	Ship beriberi	Beriberi	Polyneuritis gallinarum	Pellagra
Cardiac hypertrophy and degeneration			Scurvy	Guinea-pig scurvy	Ship beriberi	Beriberi	Polyneuritis gallinarum	Pellagra
Palsy				Guinea-pig scurvy	Ship beriberi	Beriberi	Polyneuritis gallinarum	Pellagra
Nerve degeneration						Beriberi	Polyneuritis gallinarum	Pellagra

* May occur during adolescence but probably is not encountered in adults.

legumes, and canned foods; those which are one-sided and are too largely made up of cereals or carbohydrates and particularly so when the outer part of the grain has been removed by milling. Such diets are found in the South where corn meal is largely used with the resulting pellagra; in the tropics where polished rice is the staple diet with the resulting beriberi; in some institutions or on vessels where the element of freshness has been neglected with the resulting scurvy, and so on.

Many persons are compelled to live on deficiency disease producing diets through poverty or ignorance. They cannot afford meats in any quantity. Such people should be instructed by the government authorities as to the diet best suited for their needs and in the use of the milled grains and the free use of beans and peas, fresh or dried (not canned).

There are differences in the susceptibilities of various persons to the lack of vitamins and apparently some fed on deficient diet do not develop marked diseased conditions. This is probably due to their getting vitamin containing foods at various times of the year and so escape, but if carefully examined they may show some of the symptoms in a somewhat undeveloped or *fruste* form. Attention to this in the future will probably clear up many obscure disease conditions.

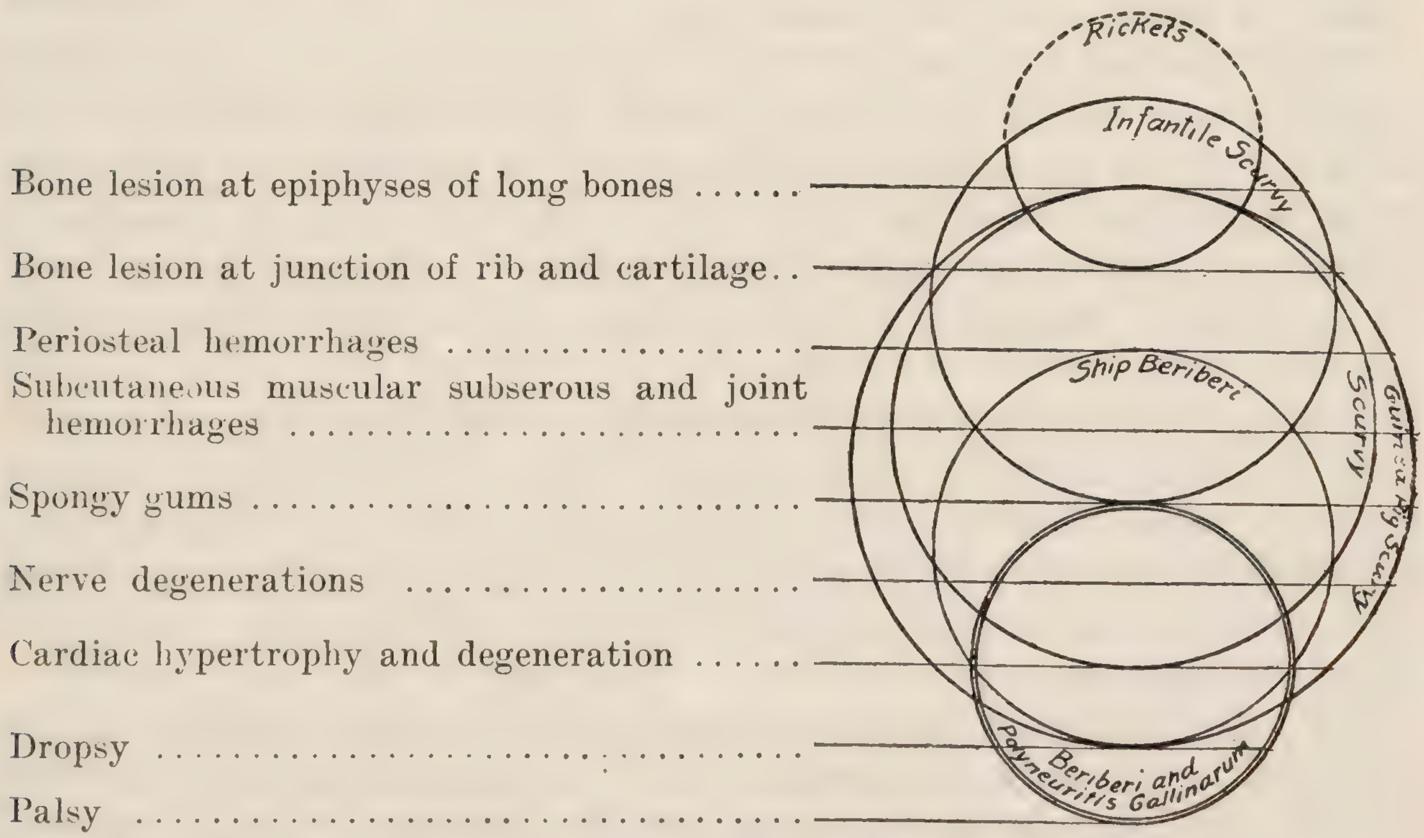


Fig. 10.—Chart showing affinities of the food deficiency syndromes.

The deficiency diseases include rickets; the scurvies, infant, adult and of guinea pigs (experimental); tropical and ship beriberi, doubtless degrees of the same disease and here may be included the infantile beriberi described in the Philippines as "Taon"; the experimental polyneuritis of fowls, and pellagra. These diseases are

apparently all due to a food deficiency in the matter of vitamins and they are all susceptible of further investigations as there are many points that need clearing up. They have certain symptoms in common, but they do not all have the same grouping of the symptoms. The most important of the symptoms are paralysis; dropsy; cardiac symptoms including dilatation of the right heart, dyspnea, cyanosis and oliguria; spongy gums; a tendency to hemorrhage skin; and bone changes. This is very well shown in the figure from Darling (Journ. Am. Med. Assn., Oct. 10, 1914).

The pellagra syndrome includes stomatitis, gastro-intestinal symptoms, erythema and multiple nervous lesions. Darling omitted it from the table, but we have added it in the table given on page 722.

SCORBUTUS OR SCURVY

Scurvy is a disease of ancient lineage, and Hippocrates describes it as occurring in armies. Since that time many records have been made of its ravages. It most frequently occurred where large numbers of people were fed in common. Armies, prisoners, and camps suffered, as did sailors. As a matter of fact, the disease in sailors gave the impetus to study the prevention of the disease, although Kramer in 1720, in his "Medecina Castrensis," really stated almost as much about the treatment as we know today.

"Seek the cure of scurvy neither in the armamentarium of the physician nor in the apothecary shops. The druggist will be of as little aid to you as the art of the surgeon. On the other hand, employ fresh vegetables, the juice of fresh antiscorbutic plants, oranges or lemons, or the juice of these fruits preserved with sugar; in this way without other means you will be able to overcome this terrible disease.

"But if you can get green vegetables; if you can prepare a sufficient quantity of fresh antiscorbutic juices, if you have oranges, lemons, citrons, or their pulp and juice preserved with whey in cask, so that you can make a lemonade, or rather give to the quantity of 3 or 4 ounces of their juice in whey, you will, without other assistance, cure this dreadful evil."

We have not gone much further. Lind, writing in 1757 of his experiences at sea, and Captain Cook's remarkable voyage in 1772, did much to spread the knowledge of the prevention of the disease. Cook sailed three years without any scurvy in his crew. He thought it was prevented by using "sweet wort," which he prepared fresh. He also used quantities of sauer kraut. The freedom of the Dutch sailors was attributed to the use of sauer kraut, and this was introduced into the British Navy in 1780, to be supplanted in 1795 by the juice of lemons or limes, and these were made a compulsory part of the ration in 1804. Eskimos living on fresh meat eaten raw or only

partly cooked do not suffer from scurvy, but polar expeditions have suffered severely, and in many instances prevention and cures are affected by the use of fresh raw meat. In spite of this knowledge scurvy has taken a heavy toll, not only adults but infants, the latter more and more frequently due to the increased use of heated and preserved foods. For a complete study the reader is referred to Alfred Hess's monograph "Scurvy: Past and Present."

Much has been said and written on the subject of vitamins in connection with scurvy, and the unknown substance is now called Vitamin C or the scurvy-producing vitamin. (See Vitamins.) Researches have shown that it is widely distributed in foods, that it is destroyed or weakened by heating, by drying, and by the action of various agents, notably by alkalies. For extended information concerning this vitamin the reader is referred to Sherman and Smith's "The Vitamins." It is found in large quantities in orange juice, lemon juice, raspberries, fresh or canned; tomatoes, fresh or canned; onions, raw cabbage, potatoes, lettuce; in berries; in liver; possibly in some of the other fresh meats. In a general way it may be said to be most frequent in fruits and leafy vegetables, but it varies in amounts. In milk it is variable, depending largely on the food used for the cows. It is not found at all or only in questionable quantities in cereals, except in sprouted grains, or sugars or starches, or fats and oils. Lime juice is often spoken of in this connection, but the reputation of the lime as an antiscorbutic was probably largely made on the fact that lemon juice was used for it, and lemons have about four times as much of the Vitamin C as limes. It is also stated that the Mediterranean lime is richer in antiscorbutic properties than the American lime. Lemon tablets may be prepared which represent about half a lemon. These will preserve the vitamin at a room temperature for over a year, and are useful on exploring expeditions, in armies, and under other conditions where fresh fruit is not obtainable. The recipe is given in the section on Recipes. Orange juice has been dried by processes similar to preparing dried milks, and found to retain the antiscorbutic properties for several months or longer.

The prophylaxis of scurvy is very important, particularly so in sailors, soldiers, prisons, and in groups of people fed together. The addition of orange juice, lemon juice, raw or canned tomatoes (warmed, but not cooked), onions, potatoes, cabbage, and the like will prevent the disease.

The treatment of the disease after it has developed is simple and dietetic. The foods mentioned above as possessing high antiscorbutic properties should be administered. If the mouth is so sore as to interfere with mastication, soups and broths made of these foods and fruit juices should be given. If the better antiscorbutics cannot be obtained, efforts should be made to secure berries or leafy vegetables. Even pine needles have been used successfully. Hess has used

strained, sterilized orange juice slightly alkalinized, intravenously, with good results. The addition of gelatin to the diet is not amiss.

Infantile Scurvy (Barlow's Disease).—One of the best contributions to this subject is the American Pediatric Society's Collective Investigation of Infantile Scurvy, 1898. In this, 379 cases were reported. Age is a marked factor, and four-fifths of the cases were between the sixth and the fifteenth month, and one-half between the seventh and the tenth month. The feeding prior to the onset of the disease was as follows:

	Cases	Alone in
Breast milk	12	10
Raw cow's milk	5	4
Pasteurized milk	20	16
Condensed milk	60	32
Sterilized milk	107	68
Proprietary foods	214	

From the foregoing table it will be seen that the proprietary foods are the most frequent cause, sterilized milk being next in frequency. Condensed milk, likewise, is not to be overlooked as a cause.

We have usually used orange juice or the juice of canned tomatoes as a preventive, and with entire success.

In the cases presenting the classical symptoms active antiscorbutic treatment should be instituted, and this should also be done where there is any question as to diagnosis. Infants who are not gaining in weight, who are irritable, and who show any tenderness or tendency to hemorrhage, should always be given antiscorbutics. We have frequently been called to see cases supposed to be infantile paralysis, rheumatism, arthritis, and what not, in which a cure resulted promptly in a proper diet, and cases of scurvy have been operated on more than once. The infant should be placed on human milk or, failing that, on a suitable mixture of pure fresh milk, according to the rules laid down for infant feeding. Some form of fresh fruit juice should be given, orange juice, tomato juice, and lemon juice are most frequently used. From ½ ounce to 2 ounces a day is usually sufficient. Potatoes mashed and mixed with milk are also recommended, especially for older infants, as are scraped ripe apple and grapes from which the skins and seeds have been removed. Gelatin is a useful addition to the diet.

Hess has called attention to what he calls latent scurvy which develops slowly as a result of insufficient vitamins. The diagnosis rests largely on the disappearance of the symptoms—stationary weight, pallor, poor appetite, etc.—following the administration of an antiscorbutic. He also calls attention to the fact that in some cases all antiscorbutics do not act equally well, potato being better in some cases than orange juice and vice versa. Orange peel rubbed up in water may also be used as an effective antiscorbutic.

The symptoms will usually become less marked in a few days, and

in uncomplicated cases of average severity complete recovery will follow in one or two weeks. When there is anemia, cod-liver oil and iron are of service.

BERIBERI OR KAKKÉ

This disease is seen throughout the tropics and in a somewhat milder form on board ships where the food is not of the proper quality. The ship beriberi has less involvement of the nerves and palsy is rare. It has been reported in the fishermen of Newfoundland and elsewhere too often to need comment. A full account will be found in Vedder's monograph, published in 1913.

It is definitely a deficiency disease produced generally from eating a diet composed too exclusively of polished or highly milled rice, but it may be produced by other diets deficient in vitamins. For example, Walcott, who reported the disease from the Amazon Basin, ascribed at least a part of it to the use of farina de agua, a flour made by the prolonged maceration of the wild or poisonous mandioca (Manihot utilissima), which is extensively used by the Brazilian laborers.

That the disease is due to faulty diet is abundantly proved by observations on animals, by producing it in the human being by feeding experiments as has been done by Fraser and Stanton (Studies from the Institute for Medical Research, Federated Malay States, 1909, No. 10), and by Strong and Crowell (Philippine Journal of Science, 1912, VII, 271), as well as by the fact that it has been eradicated from many institutions and groups of soldiers, sailors or laborers. These are so well known that one need only mention the eradication from the Japanese army and navy, from the Philippine scouts (Chamberlain, Journal Am. Med. Assn., April 24, 1915, 1215), from the laborers of Java and in Brazil. Eijkman, as mentioned above, produced the same or an analogous disease in fowls and also showed that rice polishings would cure the disease. Fraser and Stanton then demonstrated that the active substance could be dissolved out of rice polishings by 0.3 per cent. hydrochloric acid and that it was soluble in alcohol.

Unpolished or slightly polished rice has been found to contain 0.5 to 9.75 of phosphorus pentoxid and as a means of prevention the prohibition of rice containing less than 0.4 per cent. has been suggested. Fifteen grams of rice polishing mixture with milk and sugar given twice daily is used as an effective cure.

The disease may be produced not only by a diet made up too largely of rice, but also by the too exclusive use of other highly milled flours, of hominy, tapioca, sago, and in fact by foods rich in carbohydrates in general. Sterilized foods, such as canned and other heated products have the same action. There are two forms of beriberi, dry and wet; in the former the clinical picture is the nerve symp-

tom syndrome in an emaciated person; in the latter, in an edematous person. In the former it is believed that there is a deficiency of Vitamin B; in the latter a similar deficiency plus a diet which means protein starvation.

Vedder gives the following simple rules for the prevention of the deficiency diseases:

1. In any institution where bread is the staple article of diet, it should be made from whole wheat flour.
2. When rice is used in any quantity, the brown under milled, or so called hygienic rice, should be furnished.
3. Beans, peas or other legumes, known to prevent beriberi, should be served at least once a week. Canned beans or peas should not be used.
4. Some fresh vegetable or fruit should be issued at least once a week and preferably at least twice a week.
5. Barley, a known preventive of beriberi, should be used in all soups.
6. If cornmeal is the staple of diet, it should be yellow meal or water-ground meal, that is, made from the whole grain.
7. White potatoes and fresh meat, known preventives of beriberi and scurvy, should be served at least once a week, and preferably once daily.
8. The too exclusive use of canned goods must be carefully avoided.

Vedder feels sure that the strict application of these rules will eradicate scurvy and beriberi, and believes that they would be equally efficacious in eradicating pellagra from the United States.

Walcott states that since 1912 the treatment at Candelaria Hospital for beriberi has been changed to a strict dietary condition consisting of:

1. Soups of beans and peas, fresh vegetables, fish chowder and eggs.
2. Meats: all varieties, but served in underdone condition.
3. Eggs, usually six daily.
4. Fresh cows' milk several times daily.
5. Irish potatoes, beans and peas and other fresh vegetables.
6. Fresh fruits.
7. Rice bran two times daily.
8. No bread allowed as there is no whole wheat or graham or rye bread to be had here as yet.

Chamberlain gives the following dietary used by the Philippine scouts and which have been found to be efficient in preventing the disease.

TABLE FILIPINO RATION, ARMY REGULATIONS 1913, PARAGRAPH 1205, IN FORCE FROM JUNE, 1911, TILL PRESENT DATE [1]

Component Articles.	Quantities, Ounces.	Substitutive Articles.	Quantities, Ounces.
Beef, fresh	12	Bacon	8
		Canned meat	8
		Fish, canned	12
		Fish, fresh	12
		Hard bread	8
Flour	8	Soft bread	8
Baking powder, when in field and ovens are not available	0.32		
Rice, unpolished	20		
Potatoes	8	Onions	8
Coffee, roasted and ground	1		
Sugar	2		
Vinegar	0.08		
Salt	0.64		
Pepper, black	0.02		

PELLAGRA (Maidismus)

The first description of pellagra was by a Spanish physician, Casals, in 1707. He noticed the presence of the disease in the Asturias and ascribed it to an insufficient diet. In 1771, Frapoli gave it the name pellagra, a word meaning rough skin, referring to the very evident cutaneous lesions, in addition to which were the deterioration of the nervous system and progressive weakness. In 1810, Mazari thought the disease was due to spoilt maize and two schools arose, zeists claiming maize as a causative factor, and antizeists, who believed that there was some other cause. Among the former was Lombroso, and among the latter of recent years is Sambon, who had a theory that the disease was caused by an infectious agent transferred by gnats.

There seems to be little doubt at the present time, owing to the numerous investigations that have been undertaken, that the disease is intimately connected with the diet and is probably due to a deficiency of vitamins. Some have held that the disease was due to the anaphylactic action of the grain, and still another theory is that the use of maize as a food introduces a substance into the blood which is acted on by sunlight, the exposed portions of the body suffering more than those that are covered. This is the so called photodynamic theory. The disease is five times more common in women who remain in the house than in men.

In the corn the vitamins are present in the germ and this is at the exposed place on the grain and is apt to be injured or undergo changes

[1] "Scout organizations will be required to use the entire allowance of the meat component, and not more than 16 ounces of rice per day to be used for each ration. The purchase of 1.6 ounces of beans per ration in substitution of the portion of the rice ration not drawn will be made, and use of as large an extent as possible of native products, such as camotes, mongos and squash, will be required."

from external agencies and in the modern milling of corn what is known as degermination is practiced, which removes the germ which is sold under the name of corn chops as a cattle food. Sometimes a granulated cornmeal is made.

Wood has studied the composition of corn chops and cornmeal with the following results:

	Protein, per cent.	Fat, per cent.	Carbohydrate, per cent.	Fiber, per cent.
Meal	9.2	1.9	74.4	1.0
Chops	9.0	7.0	70.0	9.0
Germ alone	21.7	29.6	44.7	
Endosperm	12.2	1.5	85.0	

He also analyzed various flours with reference to their content in phosphorous pentoxid. The results are very interesting.

	P_2O_5 per cent.
Corn chops	1.15
Water ground meal (North Carolina)	0.78
Whole meal, steam milled (Virginia)	0.60
Highly milled meal (Ohio)	0.29
Steam-milled meal (North Carolina)	0.58
Wheat middlings (offal of mill)	0.98
Whole-wheat flour	0.50
Average wheat flour (bought in Wilmington, North Carolina)	0.14

There are numerous references of the disease being produced in human beings by feeding flours and cereals. Nightingale, in Rhodesia, noted it in prisoners and effected an immediate cure by the use of whole cornmeal. Little observed polyneuritis, similar to beriberi or identical with it, due to deficient diets, and observations have also been made on chickens and other fowls in which polyneuritis may be produced by feeding them on foods lacking in vitamins. This can be cured promptly by the feeding of corn chops or other foods rich in vitamins. Wood suggests the use of corn chops fed to human beings and has used it in several cases with striking results. It keeps poorly, however, and must be used fresh to be of any value. A material may be extracted from it, but only by the use of enormous amounts of alcohol, rendering the cost much too great for ordinary use.

Wood has called attention to the fact that the disease was not present in the south prior to the civil war, and the old water mills ground a coarse whole grain flour, and he has not been able to find the disease in the remoter districts, where the modern innovations have not reached. Voegtlin, Myers, and Sullivan have demonstrated that the vitamins are destroyed by the use of soda and by certain baking powders in the preparation of bread, regardless of the original quality of the flour or meal. They also showed that the use of sour milk in connection with the soda would prevent this destruction and that baking powders that contain enough tartaric acid to neutralize

the sodium carbonate after the production of the carbon dioxid would not destroy the vitamins.

Lombroso said that it is impossible to cure the disease, because he might as well advise his patients to be rich as to eat a diet which they could not afford, and if a patient were rich he would have the proper food and so not have the disease.

There are some cases which resist dietetic treatment. These are usually severe and eventually die. It is important to cure any other disease, such as hookworm infection, and to avoid physical strain. There is a curious seasonal tide of the disease where it is endemic, appearing in March or April, increasing in May, reaching a peak in June, and then rapidly declining, until after September few are seen.

Good hygiene is an important factor both in the prevention and cure of the disease. The disease may be prevented and a cure usually effected by a proper diet. In 1866 Roussel emphasized the importance of milk, but his teaching fell on deaf ears until the present time, when milk is regarded as the most important food in connection with the disease. Goldberger suggests the use of 3 pints or more daily of milk, skimmed milk, or buttermilk in addition to the other foods. The diet should be high in proteins (100 to 125 grams a day), and in addition to milk, eggs, lean meat, particularly fresh meat, beans, peas, and other legumes, especially the soy bean and its flour, should be used. Of almost equal importance is the use of plenty of green vegetables, cabbage, sauer kraut, spinach, chard, kale, sprouts, chicory, celery and the like, and fresh fruit of almost any kind. These latter may have to be limited in the presence of severe diarrhea.

UNCLASSIFIED DISEASES

ACIDOSIS

After reviewing the contributions of the past few years one is tempted to paraphrase Pilate's question and ask "What is acidosis?" Henderson has described acidosis as any disturbance of the acid-base equilibrium whereby the power to resist the acids in the body is lost. The metabolic processes are attended by acid formation and the equilibrium is maintained by the excretion of carbon dioxid through the lungs, by the excretion of acid by the kidney, by the blood having the power to have a certain amount of acid added to it without having the H ion concentration much changed and by the power of the body to form ammonia, which helps to neutralize the acids that are formed.

The condition of acidosis may be studied in many ways, but most of the methods are as yet in the observation stage and also require a great deal of technical training as well as laboratory facilities, so they are not available to the average practitioner. The CO_2 tension in the alveolar air is one method that gives satisfactory evidence as

to the patient's condition. Various methods of estimating this are in use and the normal set at between 39 and 45 in moderate grades of acidosis and it may fall to 30, and in the severe and fatal cases it may be between 15 and 30 or lower. An account of the various methods of making these tests and much other information on acidosis will be found in the Transactions of the American Association of Physicians for 1916, and the references therein. Sellards has suggested a simple method, that of giving the patient sodium bicarbonate by mouth and noting the amount necessary to turn the urine alkaline to litmus paper. In using this test 5 grams are given and at the end of two hours the patient voids and if the urine is still acid the dose is repeated. If the patient is unable to void the next dose is put off until after the next urination and if the test is carried on into the night the patient is not aroused. It generally takes from 5 to 15 grams to change the reaction of a normal person's urine from acid to alkaline.

A person with an acidosis may respond differently to the various tests and it is probable that the underlying cause may vary greatly.

The relation of the ammonia nitrogen to the total nitrogen excreted in the urine is often studied, but as Howland and Marriott state, a relative increase in the ammonia nitrogen suggests an acidosis, but needs confirmation with other tests.

The presence of the acetone bodies in the urine may be taken as evidence that there are abnormal acids in the blood, but it gives no information as to the amount. As a control in starvation cures tests for acetone and diacetic acid may furnish information of practical value, but presence of these substances, particularly in the urine of children, is of such common occurrence as to render the mere finding them present of little or no value.

Acidosis is found in a great many different diseases and conditions. That of diabetes is considered under that disease. Among the other conditions in which it occurs may be mentioned Asiatic cholera and the severer diarrheas of infancy, the cyclic vomiting of children, in diseases of the heart and kidneys, and the combined renal and cardiac diseases, in cachectic states and the severe anemias, in pregnancy and eclampsia, in post-operative shock and after the administration of anesthetics and in certain febrile conditions.

The production of acidosis may be outlined as follows: When protein is oxidized the sulphur and phosphorus form sulphuric and phosphoric acids. These are ordinarily neutralized by the carbonates of sodium, potassium, calcium and magnesium. These carbonates are formed from the salts or organic acids of these substances, taken in the fruits and vegetables of the food, by oxidation, with the addition of water and carbon dioxid, the latter being excreted through the lungs. When these are not sufficient the ammonia formed in the body neutralizes the excess. The ammonia is formed from the amino-acids

in the liver or muscles being deaminized, that is, the amino group, NH_2, is split off and changed to ammonia and ordinarily this unites with water and carbon dioxid to form urea which is excreted through the kidney. If, however, the acids are in excess, ammonia salts are formed which are also excreted in the urine and the relation of the ammonia nitrogen to the urea nitrogen shows the amount of neutralization by ammonia in the body. An excess of ammonia in the urine does not necessarily mean an acidosis, but when it is present other tests may be used to determine the condition. In pathologic conditions the acids may be present in very large quantities together with organic acids, as diacetic and oxybutyric, formed from the incomplete metabolism of the fats, and these may be in excess of the power of the body to neutralize them and a condition of acidosis may be produced.

The Treatment of Acidosis.—This depends on the kind of acidosis, for a discussion of which the text-books of medicine should be consulted. In hospital practice the treatment is aided by the determination of the carbon dioxid tension in the alveolar air, which may readily be accomplished by using Marriott's method, and the determination of the bicarbonate reserve of the plasma by Van Slyke's method. These may also be applied in general practice, but Sellard's test, described above, is usually satisfactory and temporarily curative at the same time.

In all cases of acidosis without reference to cause free elimination is of primary importance, and this is aided by the administration of water, by mouth if possible, in some cases by Murphy drip, if not contraindicated, or by giving fluid intraperitoneally, subcutaneously, or intravenously. The intraperitoneal route has certain advantages. Normal salt solution or Ringer's solution may be used; the technic is given in another place.

In acetone body acidosis glucose solutions are administered, (See also diabetes.) It may be given by mouth, usually 5 or 10 per cent. solutions (see Marasmus), or by Murphy drip, using a 5 per cent. solution with or without sodium bicarbonate, or 5 to 10 per cent. solutions may be given intravenously. Howland and Marriott advise it in quantities up to 20 c.c. per kilo of body weight. It must be given slowly.

The use of alkalies is necessary if the reserve has been depleted. This may be given until the urine becomes alkaline or the exact amount needed may be calculated.

Howland and Marriott give the following: The blood and tissue fluids contain approximately 3 gm. of sodium bicarbonate per kilogram. As approximately 70 per cent. of the body weight is made up of such fluids, the total amount of bicarbonate in the body is approximately 2 gm. per kilogram of body weight. If the blood bicarbonate or the alveolar carbon dioxid tension is diminished one-half, then it

is necessary to administer 1 gm. of bicarbonate per kilogram of body weight to restore normal conditions. This may be expressed in the form of a formula as follows: $\frac{40-T}{40} \times 2\ W =$ grams of sodium bicarbonate needed; or, $\frac{60-V}{60} \times 2\ W =$ grams of sodium bicarbonate needed. Either of these formulæ may be used, depending whether the degree of acidosis is measured by a determination of the alveolar carbon dioxid tension or by the bicarbonate reserve of the blood-plasma. In the formulas T = alveolar CO_2 tension in millimeters, V = volume per cent. CO_2 in plasma as determined by the Van Slyke method, W = body weight in kilograms.

It may be given by mouth, by Murphy drip, or by intravenous injection. By mouth in doses varying from 15 grains to a teaspoonful well diluted. A small amount of fruit juice, lemon, orange, or grapefruit may make it more palatable. By other routes a 4 per cent. solution is generally used. The soda should be dissolved in distilled, sterilized water, and should not be heated to sterilize it. It should be given slowly, from 15 to 20 c.c. per kilogram of body weight at a time.

If very large doses of sodium bicarbonate are given, sulphate of magnesium should be injected subcutaneously to prevent tetany. This is administered in 8 per cent. solution up to 2 gm. per kilogram of body weight.

The administration of soda has been greatly abused of recent years, especially in its prolonged use in cases in which no acidosis was present. Overdoses may cause tetany, but this usually stops if the sodium bicarbonate is discontinued.

Post-operative and Post-anesthetic Acidosis.—Some of these cases may be due to post-operative shock, but the majority are caused by the administration of the anesthetic. Ross and Hawk found that in dogs that those on a mixed diet did not develop any glycosuria after anesthetic, while those on a carbohydrate-free diet did. It is a well known fact that children and adults that are subject to acidosis are prone to develop it after the administration of an anesthetic and that the condition not infrequently proves fatal. This may in almost all cases be prevented by proper prophylactic diet, which consists of reducing the fats to a minimum and adding additional carbohydrate to the diet, preferably in the form of sugar. Some advise the use of several doses of a 10 per cent. glucose solution several times a day for three days before the operation. We have had extremely satisfactory results from the use of cane sugar, either in the form of lump sugar or of candy, so that we have never tried the glucose as a prophylactic. For two or three days prior to the operation the patient should have sufficient bicarbonate of soda to keep the urine alkaline. It takes from 5 to 15 grams a day to do this with an adult, and, occasionally, more.

The treatment is as outlined for acidosis.

Other Forms (See also Cyclic Vomiting).—A very severe and dangerous form is sometimes seen in severe diarrheas, especially of the cholera infantum type. These are also treated as the above.

Intraperitoneal injections of sodium bicarbonate solution may also be used if the patient is in a hospital where a proper technic may be observed. Great care is needed to prevent infection.

Transfusion from an alkalinized donor has been suggested and carried out by Gettler and Lindeman (Journal of the American Medical Association, February 24, 1917, p. 594). The blood of the donor and the recipient must be compatible and the donor's blood alkalinized by the administration of sodium bicarbonate.

CANCER AND DEMINERALIZED FOOD

Horace Packard (Boston Medical and Surgical Journal, March 21, 1912, p. 452) has called attention to a point which is well worthy of study, and that is that the great increase in cancer has apparently followed the use of foods which have been more or less demineralized, and that by living upon such foods the resistance to cancer, whatever the nature of it may be, is greatly diminished. The foods which have thus been robbed of a very essential part are wheat or, in countries where rice is extensively used, rice; the outer surface of both grains being removed, there is left chiefly a residue of starch. Potatoes peeled and cooked by boiling lose perhaps 50 per cent. of their mineral content. Packard, having this theory of mineral starvation in mind, has been giving to some of his inoperable recurrent cancer cases a diet rich in minerals, and has found apparently an arrest of the disease and a general condition of good health quite at variance with former experiences in similar cases. His dietary is as follows:

(1) Exclude all white flour bread, and all articles into which white flour enters, and substitute bread made from whole wheat flour. There are whole wheat flours on the market which are finely milled and which are satisfactory.

(2) Potatoes, next to bread, form the most important and widely used article of diet, and properly conserved in cooking they are rich in the food salts, which are located in the peripheral portion immediately beneath the skin. Therefore, one or two baked potatoes daily are advised, prepared as follows: Discard the heart or central starchy portion and eat the peripheral portions rich in mineral ingredients, conserving to the very outer skin. The common way of cooking potatoes by paring raw, soaking in cold water for an hour or two, then boiling, dissolves out and boils out about 50 per cent. of the food salts.

(3) Encourage the eating freely of well-cooked fresh vegetables, apples raw or cooked in any way, and fresh ripe fruits.

(4) Meats and fish may be used moderately, according to inclination, bearing in mind that these probably make no difference one way or the other in the development or growth of cancer. Flesh foods,

as consumed by the human family, are relatively poor in the food salts, and at best the elements of such food reach us second hand and constitute a very poorly balanced article of diet, in that we consume almost exclusively the muscle tissue, thus getting none of the food salts stored in the nerves, bones, and other structures.

A normal amount of protein must be included in the dietary, and if not taken as flesh food or in vegetables, it must be made up in eggs, cheese, milk, and leguminous vegetables.

Bulkley, at the New York Skin and Cancer Hospital, suggests the following vegetarian diet with a minimum of protein. The following menus average about 2100 calories per day.

FIRST DAY

Breakfast

4 ounces Rice
3 " Corn bread
1¼ " Butter
½ " Sugar
Hot water

Dinner

5 ounces Vegetable soup
3 " Baked potatoes
3 " Stewed celery
1 " Graham bread
1¼ " Butter
1 Fresh apple

Supper

4 ounces Rolled oats
2 " White bread
1¼ " Butter
4 " Stewed prunes
¼ " Sugar
Very weak tea

SECOND DAY

Breakfast

Orange
4 ounces Hominy
2 " Graham toast
1¼ ounces Butter
½ " Sugar
Postum

Dinner

5 ounces Pea soup
3 " Macaroni
3 " String beans
3 ounces Carrots
2 " Bread
1¼ " Butter
Dates

Supper

4 ounces Cream of Wheat
2 " Graham toast
1¼ " Baked apple
2 " Crackers
1¼ " Butter
¼ " Sugar
Very weak tea

THIRD DAY

Breakfast

Banana
4 ounces Pettijohn
2 " White bread
1¼ " Butter
½ " Sugar
Hot water

Dinner

5 ounces Corn soup
3 " Baked potatoes
3 " Spinach
3 " Boiled onions
2 " Bread
1¼ " Butter
Raisins

Supper

4 ounces Farina
4 " Stewed figs
2 " Graham crackers
1½ " Butter
¼ " Sugar
Very weak tea

FOURTH DAY

Breakfast

Raw apple
4 ounces Cornmeal mush
2 " Graham bread
1¼ " Butter
½ " Sugar
Postum

Dinner

5 ounces Vegetable soup
4 " Baked beans
3 " Cauliflower
3 " Asparagus
2 " Bread
1¼ " Butter
Orange

Supper

4 ounces Rice
4 " Stewed prunes
2 " Graham crackers
1¼ " Butter
¼ " Sugar
Very weak tea

FIFTH DAY

Breakfast

Orange
4 ounces Cracked wheat
3 " Corn muffins
1¼ " Butter
½ " Sugar
Hot water

Dinner

5 ounces Sago soup
4 " Spaghetti
3 " Lima beans
3 " Boiled onions
1¼ " Butter
Dates

Supper

4 ounces Cream of Wheat
Sliced orange
2 ounces Oatmeal crackers
1¼ ounces Butter
¼ " Sugar
Very weak tea

SIXTH DAY

Breakfast

4 ounces Samp
2 " Graham toast
1¼ " Butter
½ " Sugar
Postum

Dinner

5 ounces Celery soup
4 " Baked potatoes
3 " Carrots
3 " Spinach
1¼ " Butter
2 " Bread
Figs

Supper

4 ounces Wheatena
4 " Stewed figs
2 " Uneeda biscuit
1¼ " Butter
¼ " Sugar
Very weak tea

Repeat this bill of fare on successive days.

Some interchange of the different articles may be made, to suit the appetite or convenience of patients; but in the main this bill of fare should be followed.

Bread at least 24 hours old may be taken as desired.

A little old cheese may be grated on the macaroni and spaghetti, but not cooked with it.

One boiled or poached egg may be taken for breakfast every other day, and very fat bacon on the alternate days, unless otherwise directed by the physician.

It is desirable to eat the skin of potatoes.

Each and every meal should be eaten very slowly, for half an hour, with long chewing.

One tumbler of water is to be taken with each meal, but not when food is in the mouth; also a tumbler full of hot water, one hour before breakfast and supper.

No milk is to be taken unless specially ordered.

The cereals are to be boiled with water, three or four hours, and may be cooked in the afternoon and heated in the morning, adding more water. Rice farina and Cream of Wheat require only one hour. Chopped dates, figs, raisins, or currants may be added to cereals when desired.

All the cereals are to be served very hot, on hot plates, and eaten with butter and salt to taste (not milk and sugar). They are to be eaten very slowly, with a fork, and very well chewed.

The crackers with supper may be varied to suit the taste, they should be eaten dry, with butter, and chewed very thoroughly.

Nothing should be taken between meals, unless especially directed, and the life should be as simple and healthful as possible, with early and long bed hours.

Kessler[1] suggests a sulphur-free diet, which is practically obtained by using the above diet with the addition of other foods low in sulphur. Among these may be mentioned egg-white, casein, butter; fish such as halibut, salmon, white fish, cod, mackerel, herring, shad, and the like; of the vegetables, rhubarb, beets, chicory, lettuce and other green salads, pumpkin, beans, peas, nuts, such as almonds and chestnuts, and of the fruits, olives, plums, oranges, and huckleberries. This list could be extended.

The subject of cancer and diet seems to us to be worthy of a careful scientific study. Until this is done this method of management is entirely empiric.

DUCTLESS GLANDS, TUMORS AND DIET

Sweet, Corson-White and Saxon have made some studies on the transplantable tumors of rats and mice and they suggest a possibly fruitful field in dietetic research. Some years ago Hunt, as noticed in the preface of our fourth edition, showed by experiments on animals that certain diets had specific effects on the thyroid gland in some of the lower animals. The investigators just referred to found that the tumors could be influenced in their rate of growth by changing the diet, making the tumors grow either fast or slow, according to the nature of the feeding. It was also found that castration of the male renders the animal more receptive of the transplant and the rate of growth is increased.

This suggests that study of diets in human cancer might show that foods exert an influence for good or bad through their acting upon the glands.

[1] New York Medical Journal, November 30, 1912, xcvi, 1122.

EXOPHTHALMIC GOITER

Any tendency to constipation should be relieved promptly. Foods that are apt to cause flatulency (*q. v.*) should be avoided.

The metabolism of these patients is very greatly increased so that a patient at rest may have requirements of a person at hard labor. The nitrogen equilibrium is maintained with difficulty and the body wastes rapidly. There may be alimentary glycosuria. There is a loss of phosphorous through the intestines and the amount of calcium excreted in the feces is increased. DuBois states that there is no indication against the use of fairly large amounts of protein and there is no reason to prefer the protein of milk to that of meats. As regards quantity a patient with Graves' disease needs one and a half to twice as much food as an ordinary individual of the same weight.

Tea, coffee, and tobacco should be abstained from, or, if the patient refuses to do this, their use limited to the smallest possible amount. Alcohol should be prohibited, except in habitués, when sudden withdrawal may cause great cardiac weakness.

ADDISON'S DISEASE

So long as the digestion is not seriously impaired a mixed diet, of as nutritious a mixture as possible, should be given. Milk and cream, fresh meat, fish, oysters, well-cooked vegetables, and farinaceous food may be used. Good wines or spirituous liquors may be allowed in small quantities if desired, or when needed as either a tonic or a stimulant.

When gastric irritability occurs, the treatment is the same as that for nervous vomiting—liquid, even predigested, food should be given in small quantities (see Nervous Vomiting and Feeding after Laparotomies). In some cases a mixture of two parts of lime-water and one part of milk may be used with advantage. If this is not retained, teaspoonful doses, given regularly every fifteen minutes, may be tried. In the worst cases rectal feeding may be instituted for several days, thus giving the stomach a complete rest.

When the patient becomes weakened, even when no special gastric symptoms exist, it is well to give food at short and regular intervals. Liquid and predigested food, together with milk, custards, egg-nog, sherry and egg, broths, and gruels are to be ordered.

OSTEOMALACIA

Hunger Osteomalacia.—This was studied by a number of observers during the war, and a short bibliography will be found in the article of Dalyell and Chick.[1] It develops more slowly than the osteomalacia of pregnancy; in all ages, but especially the aged; in the poorest classes, and is most marked in winter and spring. The disease is

[1] Lancet, cci, 843, October 22, 1921.

generally regarded as a disturbance of the calcium metabolism brought about by abnormal action of the endocrine glands as a result of undernutrition. There was a concurrent increase in rickets both in infants and children and of late rickets in young adults.

The treatment consists in rest, good food, and the use of cod-liver oil with or without phosphorus. Other oils may be used when cod-liver oil cannot be obtained, but they are not as effective. The therapeutic value of fats and oils corresponds roughly to their Vitamin A content. Green vegetables are also useful. Increasing the diet in caloric value by adding sugar or cereals will not effect the progress of the disease.

Other Forms.—At present, from a dietetic standpoint, osteitis deformans, osteogenesis imperfecta, and similar conditions may be grouped together. As in the above, the diet should be rich in calcium, phosphorus, and contain sufficient Vitamin A and the calcium-depositing vitamin.

DIET IN DISEASES OF THE SKIN

Certain skin affections are caused directly or indirectly by dietary errors; others are prolonged or intensified by an improper diet, and still others are connected in some way with diseases of the alimentary tract or with disturbed metabolism.

The belief that skin diseases are caused by improper food is very prevalent among the laity, and the effect of diet on the skin is often overestimated because of the common habit, which some physicians have, of ascribing almost all skin lesions to a disordered stomach.

Certain foods may cause skin lesions, usually of the urticarial type, in from a few minutes to several days after ingestion. This is evidently, in some cases, the result of reflex action; in others, of toxic substances in the food. These lesions are usually, though not always, dependent on idiosyncrasy. Brocq held that skin diseases may be engendered by the prolonged use of certain foods, and maintained that the disease might only appear years later. This has never been proved, and therefore requires no discussion.

In such metabolic diseases as gout and diabetes the existence of some of the lesions may be explained on the ground that irritating abnormal by-products are excreted together with the sweat.

Certain poisons taken in with the food may give rise to conditions in which skin manifestations play an important part. In this connection may be mentioned ergotism and pellagra. Alcohol and ''toper's nose'' (acne rosacea) are commonly coupled in the mind, although the latter may occur in individuals who have never used alcohol.

The suggestions which follow for the dietetic management of eczema may be employed with advantage in the treatment of most curable

skin diseases, as it consists chiefly in getting the patient into the best possible physical condition.

The Use of Milk in Certain Skin Diseases.—Bulkley has called attention to the idea of giving milk alone, either pure or diluted with boiling water at the body temperature, just after the alkaline tide has set in, or during its continuance, to avoid food or any substance that could call forth gastric secretion until after its absorption has been fully accomplished. The milk should have nothing whatever added to it, neither whisky nor egg, and the eating of anything with the milk should be forbidden. In order to be sure that the stomach is in an alkaline condition, the milk is better given an hour or even thirty minutes before the next meal time; and sometimes it is of advantage to give bicarbonate of soda in full doses half an hour or so before taking the milk, or the milk may be rendered distinctly alkaline by the addition of bicarbonate of soda. The milk should not be over 100° F., and should not be too rich in fat. Given at that time milk is often well borne, and in individuals who otherwise would not be able to take it, the additional nourishment causes gain in weight, and may be used with benefit in cases of acne, eczema, and psoriasis, especially in the more chronic form.

Macleod summarizes as follows the deleterious action on the skin of too much or unsuitable food:

1. It may irritate directly the mucous membrane of the gastrointestinal tract and cause flushing, especially of the face, by reflex action.
2. It may be absorbed into the blood and produce various forms of toxic erythema and urticaria.
3. It may be eliminated by the sweat glands and irritate the skin in the process.
4. It may interfere with the nutrition of the skin, weaken the resisting power to micro-organisms, and render it prone to various forms of dermatitis.

ECZEMA

The diet of both acute and chronic eczema is important. In general it may be stated that the prophylaxis in predisposed individuals consists in a simple varied diet, and the avoidance of such articles of food as are known to cause attacks of erythema or urticaria in the patient under treatment. It should be remembered that one patient will eat with impunity a food that will poison another. (See Urticaria.) In addition, anything known to cause intestinal disturbance or indigestion should be avoided.

When eczema is present, the indications are to avoid indigestion and disturbances of the stomach and bowels. In the gouty the diet should be regulated according to the suggestions laid down for the management of gout. Other coëxisting diseases should also be considered from a dietetic standpoint.

The habits of the patient should carefully be considered. If the nutrition is below normal, efforts should be made to improve it by means of nourishing food, such as milk, eggs, and meat. If, as is more often the case, the patient overeats or is obese, the diet should be restricted. The patient should avoid all indigestible articles, and partake of a diet varied according to his taste, but reduced in quantity. Alcoholic drinks of all kinds should, as a rule, be prohibited, and coffee and tea taken in great moderation, if at all. In obese patients careful regulation of the diet according to one of the methods described in the treatment of obesity will usually answer the purpose.

When the disease is due to indigestion, the result of improper feeding, the diet should be regulated according to the form of disease present. All indigestible and fried foods, pickles, and strongly seasoned or very rich foods should be avoided. The digestion is often disturbed, particularly in women, by over-indulgence in sweets and pastry, especially at wrong hours. In all cases the food should be plain, well cooked, and taken at regular intervals, no solid food being allowed between meals.

Schweninger recommends in some cases smaller meals than are ordinarily taken, at shorter intervals; in others, that the meal shall consist of but one or two dishes.

In the very severe acute or persistent forms, an absolute milk diet or a diet composed largely of milk should be prescribed. (See Milk Cure.)

Eczema in Infants.—Infantile eczema is a sad chapter in therapeutics. The more we see of it, the less we know about it. In some cases there does not seem to be any connection between it and the diet, in others the food seems to play an important part. Much has been written, but in practice the infant often fails to behave according to the book.

A few infantile eczemas are due to food sensitization (see same). If the offending food or foods can be eliminated or the patient desensitized the results are brilliant.

Some eczemas seem to be due to overfeeding in some direction, too high sugar, too high fat, and a reduction is found to help or cure the condition.

Some are due to too much food, and lessening the amount may give good results. In obese babies a maintenance diet continued for a short period may lessen or cure the skin condition temporarily. As soon as the food is increased so that the baby gains normally the eczema returns. We prefer a baby to gain in preference to a clear skin if the choice must be made between the two conditions.

On the other hand, some eczemas are seen in undernourished children, and the skin clears up when the child is given a sufficient amount of correctly chosen food.

If the baby is breast fed the addition of cereals, fruit juices, and

vegetables sometimes helps. In the bottle fed, heating the milk or using dried milk or one of the numerous milk preparations fully considered under Infant Feeding may be tried. Protein milk or one of the modifications may be used. As a rule a mixed diet gives better results than a strict milk diet.

URTICARIA

The first step in the treatment of urticaria is to secure free evacuation of the bowels. For this purpose an active saline, such as sulphate of magnesia, should be given. Following this, the diet should be very simple until the urticaria has disappeared. Preferably a milk diet should be given, lime-water or an effervescing water being added to the milk if necessary; if there is indigestion, the milk may be peptonized. When there is a diminution in the quantity of urine excreted, alkaline diuretics may be prescribed or Vichy water may be drunk freely.

In many individuals the attacks are brought on by certain articles of diet. What these are may generally be determined by careful observation. Oysters, crabs, and other shellfish are a frequent cause. These and other articles of diet, if they are not fresh or are beginning to spoil, are also frequently responsible for this disturbance. Strawberries produce a red rash of an urticarial nature in many persons. When the offending article has been discovered, it should be eliminated from the dietary.

ACNE

In certain persons acne may be overcome by careful dieting. In some, special articles of diet, such as buckwheat cakes and other fried foods, greasy doughnuts, rich pies and cakes, and, in fact, almost any indigestible article of diet, have been held responsible for the disease.

In giving directions regarding the diet it is well to prohibit all indigestible foods, such as those just mentioned, and to prescribe a substantial varied diet of fresh food of the more easily digestible kinds. In the severe and resistant cases a milk diet may be tried, and Moser and Pieper suggest that milk be skimmed to remove the most of the fat. Bulkley forbids fats, butter, alcohol, smoked meats, and many other articles of diet. Other authors interdict tea, coffee, cheese, fish, and a host of other foods have been named as injurious.

The bowels should be regulated, and hot water or Vichy taken freely between meals. Careful dietary studies made in connection with acne might prove of considerable value.

ACNE ROSACEA

As has been said elsewhere, this is generally coupled in the minds of the laity with alcoholism. Although alcohol is often a causative factor, the disease occurs also in those who never use alcoholic beverages. Jackson maintains that the use of large quantities of strong

tea may also produce it. In general the diet should be bland and unirritating. Rich and highly seasoned food, as well as alcohol, should be avoided. Tea and coffee, if used at all, should be taken in small quantities and not too strong. The diet should be similar to that prescribed for eczema. Many of the patients, it will be found, prefer the pleasures of the table to a possible betterment of the skin disease.

PSORIASIS

Diet is apparently of little value in the treatment of this condition. Many authors have recommended various forms of diet, but in general it may be said of this, as of other skin diseases, that the diet should be such as the general condition of the patient demands. If the patient is thin and debilitated, a nourishing diet should be ordered, whereas if he is obese, his diet should be restricted.

Brocq insisted on the value of regulating the diet of patients of gouty families according to the lines laid down in the section on Gout. Other authors recommend that the use of coffee, tea, alcohol, and tobacco be prohibited in nervous individuals.

Bulkley is a firm believer in the value of a vegetarian diet and believes that he has obtained very good results by its use and attributes a failure to get satisfactory results to the nonadherence to the diet. A strictly vegetable diet may be tried, or what will be found to be satisfactory in some cases, *a diet with a minimum of protein.* This subject of minimum protein diets is discussed under the heading of Nephritis.

PRURITUS

The existence of gout, diabetes, and diseases of the liver, kidney, or alimentary tract should be definitely determined, and if such disease is found to exist, the diet should be regulated accordingly. In severe cases a milk diet may be ordered, and an abundance of mineral water between meals and on rising.

All irritating articles of diet should be avoided. All highly seasoned and indigestible dishes, pepper, especially paprika, spices, and the like, should not be used. Brocq advises that the following articles be withheld: tobacco, alcohol, tea, coffee, fish, crabs, sausage, and cheese.

FURUNCULOSIS

There is no special diet for furunculosis. The general nutrition should be improved by prescribing a varied diet of well-prepared food. If there is disease of the alimentary tract, the diet should be such as is indicated in that disease. If diabetes or anemia coëxist, they should receive attention.

SPECIAL DIETS

THE KARELL DIET OR THE MILK CURE

This treatment has been found to be of particular value in the treatment of cardiac, renal and hepatic dropsies; in congestion, simple hypertrophy, and fatty conditions of the liver; in various gastric and intestinal disorders, particularly those associated with defective nutrition, such as chronic indigestion, chronic colitis, and chronic intestinal neuralgia; in asthma due to emphysema or catarrhal conditions; in obesity; and in functional nervous conditions in which the nutrition is greatly lowered. Karell also advocated the milk cure in organic disease of the heart and blood vessels, in advanced kidney disease, and in rheumatic and gouty diseases.

Karell published his paper in 1866 (Archives General de Médecine, viii, p. 513), and this method has been used in Russia quite extensively. It was introduced into Germany with great slowness and in this country, Weir Mitchell was one of the chief exponents. It does not, however, seem to have attained the popularity which its great usefulness would suggest. The cure itself is exceedingly simple. It offers no difficulties as far as the physician himself is concerned. The patient, however, may need a very considerable amount of encouragement to make him continue the diet, which, to many, becomes exceedingly irksome.

The patient must be put to bed, the bowels kept open, preferably by saline laxatives or enemata or rhubarb or castor oil may be used. Small quantities of coffee mixed with the morning's milk later on in the cure and the use of stewed prunes or baked apples in the afternoon are also useful in relieving constipation, but are not used in the early part of the treatment. Karell's method was to give the patient 200 c.c. of raw or boiled milk, taken either warm or cold, according to the preference of the patient at 8 A. M., 12 M., 4 P. M. and 8 P. M. This method is particularly applicable to cases with dropsy or the other conditions mentioned.

The treatment suggested by Mitchell may be used as it is less disagreeable to the patient. At the beginning no other food or liquor is allowed. During the first few days thirst may be very troublesome. The patient may be allowed to rinse his mouth with water, but must not swallow any. Occasionally the patient will complain of hunger and if this is very marked a small piece of dry toast or zwieback may be given with each glass of milk. This is continued until the edema begins to diminish. When this occurs the diet may be increased, ordinarily a week, sometimes more may pass before the patient has lost a sufficient amount of fluid to be justified an

increase in the diet. A soft boiled egg, without anything else, may be given at 10 A. M. and toast or zwieback at 6 P. M. The diet is then gradually increased, adding small amounts of salt-poor foods until the patient is on a diet suitable for his condition. The foods that are suitable for patients of this kind are meat, fresh-water fish, fresh eggs, thick soups, peas and string beans, rice, corn, and hominy, or other cereals and the other foods which may be chosen from the table showing the composition of foods as regards sodium chlorid, given under the Salt-free Diet.

During all of this time for from two to four weeks after the disappearance of the edema the fluid should be kept down to 800 c.c.

By using this method some very extraordinary cures or improvements may be brought about. The general condition of the patient improves, nausea and vomiting disappears, the patient sleeps better, has not so much dyspnea. In some cases it is necessary to use digitalis or other drugs in connection with heart symptoms. The condition of the heart itself usually improves greatly. The blood pressure becomes lower and the patient voids large quantities of urine. The chlorid output is usually greater than the intake and the loss of weight may be extraordinary, as much as 54 pounds in ten days having been reported by Goodman, and in this case 31 pounds were lost in three days.

The cure seems to have some value in prognosis and Wittich regards a chlorid equilibrium, persistence of edema, stationary or diminishing urine output as all of serious import. A positive chlorid means an unfavorable prognosis. He believes if after the patient has taken the cure and there is a return of salt retention the cure should be repeated before there is a break in the compensation. The cure is not to be used where there are symptoms of uremia.

In the other conditions mentioned above milk may be given according to the method of Mitchell, who starts with four ounces of milk every two hours, gradually increasing the dose and lengthening the interval to three hours. He also prescribes a glass at night, if necessary, mixed with lime-water, or, later in the cure, mixed with one of the lactated infant's foods. He also insists on the necessity for prescribing rest with this treatment.

During the second or third week, if there is an irresistible craving for solid food, a bit of stale bread with salt or a small amount of salt herring may be given. Once a day milk soup, thickened with a cereal, may be given. After five or six weeks one other article of food may be allowed for dinner, and if the desired effect has been produced, a gradual return may be made to an ordinary diet, which should, however, still contain considerable milk.

Karell Diet List

For six to seven days 200 c.c. of milk only every four hours, at 8 A. M., 12 noon, 4 P. M., and 8 P. M. daily.

Eighth day: In addition to above quantity of milk, one soft-boiled egg and a slice of dry toast.

Ninth day: In addition to the above quantity of milk, one soft-boiled egg, one slice of toast, one tablespoonful of cereal.

Tenth day: In addition to the above quantity of milk, scraped beef, toast; cereals cooked in milk, one soft-boiled egg.

Salt must be avoided in all food.

WHEY CURE

In some of the foreign health resorts a cure somewhat similar to the milk cure has been employed, and consists in the drinking, at stated intervals, of warm whey to which alkaline mineral waters have been added. About one and one-half pints are taken daily. The amount of meat taken is limited, and the quantity of fruit and vegetables is increased. This method of treatment is said to be of value in laryngeal coughs, in chronic catarrhal conditions of the lungs or intestine, in chronic nephritis, and in chronic phthisis.

KUMISS CURE

This is a mode of cure much used in Russia. Patients who are to take the cure are generally sent to the country, where kumiss can be had. It is given frequently during the day—as often as every half-hour—but not for two hours before a heavy meal, the doses being gradually increased. The diet used with it consists chiefly of meat and fat. Sugar, fruits, salads, ices, coffee, and alcohol are abstained from. If it causes diarrhea, lime-water is added. During cold weather it produces an increase in the excretion of urine, and during warm, it increases the perspiration. Constipation is overcome and there is a gain in weight. Slight drowsiness, as in the milk cure, may occur, and stimulation of the sexual organs may take place.

This cure is useful in pulmonary tuberculosis and when there is a decided lowering of the nutrition. The effects are those obtained from a generous diet combined with open-air life.

BUTTERMILK CURE

Of recent years buttermilk and allied preparations have been used very extensively by the laity in the treatment of a great many different conditions. Buttermilk has certain uses in a diet, and the following conditions in which it is of particular value should be borne in mind: (*a*) Where fat is not digested, especially in acute or chronic fat diarrhea; (*b*) in infants and children where there is marasmus or malnutrition, due to fat diarrhea or indigestion; (*c*) in certain forms of chronic dyspepsia, especially those in which there is constipation; (*d*) in fermentative diarrheas; (*e*) in typhoid fever, where ordinary milk is not well borne; (*f*) following surgical operations, where the patient does not bear plain milk well.

The curative effects of buttermilk depend chiefly on two things: First, the low fat content, making it of great value where fat is not well borne; and, secondly, the presence of the lactic acid bacilli. In fermentative conditions lactic acid bacilli seem to be able to drive out the offending bacteria, and so reestablish a more or less normal bacterial flora in the intestinal tract. Whole milk, which has been inoculated with lactic acid bacilli, is frequently substituted for buttermilk, but it should be borne in mind that these preparations should not be used where the disease is due to fat indigestion.

Metchnikoff has extolled the virtues of the Bulgarian buttermilk, and preparations of the Bulgarian lactic acid bacilli are frequently used in this country.

THE YOLK CURE

Yolk of egg has been recommended in diabetes (see same), and also as a most desirable food for the underfed and individuals suffering from malnutrition. In many cases where the whole egg is not well borne the yolks may be used to great advantage. From 10 to 40 yolks may be taken daily in addition to some other food. The fat, lecithin, and ferments found in the yolk render it particularly suited to individuals whose nutrition is below par and who do not do well on ordinary diet.

Stern[1] gives the following sample diet, outlined for a consumptive weighing 50 kilos (110 lbs.), whose normal weight should be 63.6 kilos (140 lbs.):

	Number of yolks.	Calories in the yolks.	Total number of calories.
Breakfast:			
250 c.c. skim milk with 4 yolks	4	200	200
30 grams wheat toast			75
Early Lunch:			
Cup of coffee, 2 yolks	2	100	100
Dinner:			
One plate of soup, 4 yolks	4	200	225
Beef (very lean) 150 grams			125
30 grams wheat toast			75
4 o'clock:			
25 c.c. skim milk, 30 c.c. whisky, 3 yolks	3	150	370
Supper:			
Porridge of farina or rice 100 grams, 1 yolk, skim milk	1	50	350
Apple sauce, 75 grams			30
At bedtime:			
Night cap (90 c.c. hot water, 10 c.c. whisky, 1 yolk, teaspoonful granulated sugar)	1	50	110
	15	750	1750

The diet should be made as varied as possible if the treatment is to extend over any great length of time, and dishes devised in which the yolks may be incorporated.

[1] Medical Record, Dec. 31, 1904.

OTHER DIET CURES

Numerous methods of curing various diseases by means of special diets have been advocated by physicians and laymen from time to time. For the most part they have been the outcome of ignorance or of fanaticism, and they have often been associated with some religious exercise. Their popularity has, as a rule, been ephemeral. They are suited to those who habitually overeat. Among the better known are the following:

The Grape Cure.—This is carried out chiefly in grape-growing countries during the vintage season. It is recommended for chronic constipation, for those individuals who have enlarged congested livers, for obesity, and for various lithemic conditions; its use has also been suggested for many other conditions of the lungs, stomach, etc.

The cure consists in visiting the grape district and in eating from four to six pounds of grapes daily. Even larger quantities are sometimes taken. It is recommended that the fruit be taken, when possible, on rising and between meals. When this disagrees, as it often does, the grapes are taken at the close of a meal. The patient is given at the same time an easily digested but nutritious diet. The grapes have a decidedly laxative effect, which, combined with the change of scene and pleasant outing, often produces most beneficial results. When taken in too large quantities or in poorly selected cases, unpleasant symptoms, such as swelling of the gums from the acid and diarrhea, may occur.

Other Fruit Cures.—Other fruits are often used in various cures lasting from a month to six weeks. Apples, pears, oranges, lemons, in fact, almost all fruits have been vaunted at some time as cures. Various methods are followed, the basis of all being a greatly restricted diet with an abundance of fruit.

They are used in the same diseased conditions for which the grape cure has been prescribed.

Dry Cure.—This consists in taking as little water as is consistent with life. The water taken in addition to that contained in the food has been restricted in some cases to a pint a day. This treatment has been recommended for effusions in the serous cavities and joints, in obesity, and in gastric dilatation. Many unpleasant and dangerous symptoms may follow this treatment. Tufnell's treatment for aneurysm is founded on the same principle.

Schroth's Cure.—This is a form of the dry cure used in Europe for dilatation of the stomach, chronic peritonitis, and various other conditions. The amount of food is reduced for several days, and then nothing is given but dried bread, with the addition, at dinner, of boiled vegetables. A small quantity of hot wine is allowed to quench the thirst. When the thirst becomes intolerable, the patient is given large quantities of hot wine and then the quantity is again reduced. This treatment is severe, and great suffering is engendered, dangerous

and even fatal complications often ensuing. It has been said to be beneficial in some cases.

The Meat and the Hot-water Cure.—These resemble somewhat the Carlsbad and similar dietetic methods used in obesity and in dilatation of the stomach. The diet consists chiefly of meat-fiber, eggs, and dry toast. Hot water is taken before meals and at bed-time.

The Kneipp Cure.—This consists chiefly of a diet of fruit, bread, and milk, with small quantities of meat and vegetables. The cure directs that the patient walk barefooted in the grass while the dew is still on it. It became popular a few years ago among the faddists and among those who habitually overfed.

Fletcherism.—Countless fads in feeding have been brought forward and for the most part have been short-lived. The method of Fletcher, however, has stood the test of a number of years and is now included in the Instructions to the Medical Department of the United States Army under the heading "Method of Attaining Economic Assimilation of Nutriment and Immunity from Disease, Muscular Soreness and Fatigue."

Fletcher's chief points are "Wait for a true, earnest appetite. Select from the food available that which appeals most to the appetite and in the order called for by the appetite. Get all the good taste that is in food out of it in the mouth and swallow only when it practically swallows itself. Enjoy the good taste for all it is worth and do not allow any depressing or diverting thought to intrude upon the ceremony. Wait; take and enjoy as much as possible what appetite approves; nature will do the rest."

If there is no appetite wait for the next meal and dispel hunger if it comes by taking water.

The result of the thorough comminution and insalivation of the food leads to a thorough digestion and assimilation and the resulting feces are odorless or nearly so and remain so. This method is useful especially when there is decomposition in the intestines with the resulting joint or muscle pain and lassitude and a disposition to tire easily. To acquire the habit requires strict attention, particularly in the beginning, but once the habit is formed seems to offer little difficulty. Fletcher also believes in a low protein diet and in low total caloric value for those of sedentary habit. The meals need not take over half an hour and if strict attention is paid to the mastication fifteen minutes may suffice to satisfy the appetite.

SALT-FREE DIET

This has been mentioned in connection with several diseases, and a few words concerning it will be found useful. The sodium-chlorid content of the body is of great importance, and what might be called sodium-chlorid equilibrium is maintained in normal individuals. If

the amount taken in food is increased, there is an increase in the elimination, and if the amount be reduced, there is a diminution in the output; but a certain amount, about 2 grams, must be taken daily to make up for the inevitable daily loss. The ordinary intake of sodium chlorid is about 15 to 20 grams a day, and if this is omitted from the diet, there is a corresponding loss of fluid from the body of about 1 to 2 kilograms.

Carnivorous animals and people do not use salt and may object to it, while herbivorous animals and vegetarians require it; and the average omnivorous man also craves it, and the average individual takes much more than needed simply because the taste for salt is cultivated by many. The large amount of potassium in the vegetables drives out the sodium of the sodium chlorid in the tissue. Rice, which contains but little potassium, is the exception, and rice-eating peoples do not have the salt craving as markedly as other vegetable-eating peoples. In some diseases, as in nephritis, there is a disturbance of salt metabolism, and, as a rule, there is salt retention. If there is unilateral kidney disease, there may be differences in the salt output of the two kidneys. In normal individuals the addition of an extra amount of sodium chlorid causes an increase in the excretion, but where there is salt retention it does not. Salt retention is generally accompanied by edema. First there is an increase in weight before the edema is apparent. It is usually assumed that the salt retention causes the retention of the water. The retention of the water, however, would cause a retention of the sodium chlorid in order to bring up the fluid to the proper composition. All edemas are not due to salt retention, a fact that must constantly be borne in mind in using salt-free diets.

When edema is due to salt retention, the restriction of the intake of salt will aid greatly in the elimination of the fluid. Restriction of salt generally causes an increase in the elimination of it, due, doubtless, to the increased permeability of the kidneys due to the rest. This excessive secretion keeps up until conditions in the body have become normal. If carried to excess, salt restriction may cause edema. Salt restriction also favors sweating and elimination of water through the lungs.

Salt restriction must be practised consistently over considerable periods of time, and it may be one or two weeks before the effect begins to be noticed, and even six or seven weeks may elapse before improvement takes place. Generally the effect is prompt; occasionally there may be a temporary increase in the edema, followed by great benefit. The diet may be kept as near the minimum requirement of 2 grams a day as long as necessary. The increase should be made slowly and the effect noted.

Salt restriction may be tried in the edema of nephritis, and in that from heart disease and from other causes. It may be tried in diabetes

insipidus, in which disease it is said to be of occasional service; in all conditions in which it is desirable to limit the intake of water, as in obesity, heart disease, and when there are serous exudates. In extremely nervous and irritable people it may be tried, and it has been suggested in epilepsy. It increases the potency of the bromids. It has been suggested in scarlet fever as a protection against nephritis. It has also been advised in tinnitus aurium, especially that occurring in Bright's disease, and also in the chronic obstructive nasal catarrh which is sometimes seen as an accompaniment of the same disease. Various skin diseases, as certain forms of pemphigus, have also been treated in this way, and a trial may be made in certain persistent eczemas.

Richartz has suggested the use of salt restriction in the treatment of gastric hypersecretion. He also suggests the use of systematic lavage in these cases. The treatment should extend over a long period of time to secure the best results.

The tables in the article on Salts and on Gastric Hyperacidity will be found of interest in connection with the practical application of this form of therapy.

A salt-free diet may be easily arranged with the coöperation of the cook, and may consist of the following articles of diet, from which the patient can very easily subsist. These can be modified according to the disease for which the patients are being dieted:

Bread should be made without salt. The average bread contains about 10 grams for each kilogram, sometimes more. The bread which has not had salt added to it contains about 0.7 cg. per kilo.

Meat should always be used fresh, and most people experience little difficulty in eating it without salt. The cook should be instructed not to use salt in its preparation. Meat contains on an average about 1 gram per kilo.

Fresh-water fish may be used, but salt-water varieties contain large amounts of sodium chlorid.

Fresh eggs may be taken in any form desired, each egg containing about 25 cg.

Fresh butter that is unsalted, fresh cream, and saltless cheese may be used freely.

Potatoes may be prepared in many varieties of ways, and may be made palatable without the addition of salt. The same is true of rice.

In addition to the above, green peas, carrots, leeks, endive, lettuce, French beans, celery, artichokes, and salads of various kinds may be added to the dietary.

Sweetmeats, pastry made without salt, and raw or cooked fruit may also be used.

Chocolate will be found of especial value.

Tea, coffee, and beer, or even wine may be taken as far as the amount of chlorids which they contain are concerned.

SALT CONTENT OF FOODS—FROM LEVA

	NaCl in per cent. of natural substance.	Protein per cent. Average. For nitrogen content divide by 6.25.
A. Animal Foods		
Meats.		
Calves' kidney	0.32	17.0
Calves' brain	0.29	8.8
Mutton	0.17	17.0
Calves' liver	0.14	19.0
Veal	0.13	20.0
Beef, lean	0.11	24.0
Pork, lean	0.10	17.0
Lamb	0.09	21.7
Frogs' legs	0.05	15.5
Rabbit	0.085	
Fish.		
Haddock	0.39	17.2
Turbot, fluke	0.33	14.8
Halibut	0.30	22.0
Herring	0.27	19.5
Mackerel	0.21	21.8
Sole	0.21	
Codfish	0.16	21.0
Salmon trout	0.12	17.8
Perch	0.10	18.0
Pike	0.092	17.9
Carp	0.086	
Pickerel	0.077	18.7
Tench	0.073	
Salmon	0.061	20.0
Eels	0.021	18.6
Fowl.		
Goose	0.20	16.3
Turkey	0.17	21.1
Squab	0.15	18.5
Chicken	0.14	19.3
Duck	0.14	21.4
Wild Game.		
Hare	0.16	
Roe	0.11	
Deer	0.10	
Oysters (without sea water)	0.52	8.8
Oysters (with sea water)	0.14	8.8
Dried meat	6.3–14.1	30.0
Smoked, unsalted meat.		
Smoked bacon (American)	11.61	.15
Cassel (roast) spare ribs	8.7	6.0
Smoked salmon	7.5	
Raw ham	4.15–5.86	2.5
Prague cooked ham	3.48	
Cooked ham	1.85–5.35	20.2
Smoked bacon	1.01	10.5
Canned meats.		
Corned beef (American)	11.52	15.6
Corned beef (Australian)	0.25–4.42	
Corned beef (German)	2.04	
Dried fish.		
Codfish, salted	3.56	25.4
Codfish, unsalted	0.19	16.5
Smoked Unsalted Fish.		
Red herring	0.38	36.9
Kieler sprat	0.31	

	NaCl in per cent. of natural substance.	Protein per cent. Average. For nitrogen content divide by 6.25.
Sardines (canned in mustard or oil)	0.12	23.0
Smoked Salt Fish.		
Sardellan	20.59	
Pickled herring	14.47	
Salmon	10.87	
Haddock	2.06	22.3
Salt (Marienierte) Fish.		
Lamprey (fluid alone)	2.65	16.9
Lamprey (without fluid)	1.79	
Fish Conserved in Oil.		
Tunny fish	5.49	21.7
French sardines	1.34	
Codliver oil	0.17	
Dried gelatin	0.75	91.4
Beef marrow	0.11	
Sausage.		
Gotha Cervelat wurst	6.16	
German salami	5.37	
Italian salami	4.8–8.1	24.1
Hungarian salami	4.6–5.4	
Munich small sausages	3.31	
Mett wurst	3.15	
Liver sausage	2.9	
Frankfurters	2.2	19.6
Regensburger sausage	2.2–3.2	
German sausage	2.77	
Pastes.		
Anchovy paste	40.10	
Tongue paste	5.98	
Ham paste	5.72	
Salmon paste	5.65	
Lobster paste	2.38	
Strasburg goose liver	2.22	
Soup Material.		
Peas and sausage (German army)	11.7	
Peas and sausage	10.6	
Tapioca, julienne, potatoes, peas, etc.	10.01–15.48	
Rumford soup	10.0	
Split peas, lentils, etc.	8.18	
Beef zwieback soup (Austrian army)	0.6–4.77	
Meat Extracts.		
Cibil's fluid	14.62	
Liebig's	2.60	
Kemmereich's	1.40	
Soup Spices (also prepared foods).		
Maggis bouillon cubes	53.13	
Maggis soup spices	18.30	
Maggis bouillon extract	9.37–22.46	
Other Preparations.		
Kietz' jelly broth, Herz' Nervin, Gusto Bouillon Extract, Bovos, Vir, Sitogen, Ovos, von Ibberts' soup extract	9.48–19.64	
Prepared Sauces.		
Essence of shrimps, anchovies, etc.	19.01–21.7	
Maggis Concentré de truffes aux fines herbes, etc.	12.53–20.8	
Nourishing Preparations.		
Toril	16.73	

	NaCl in per cent. of natural substance.	Protein per cent. Average. For nitrogen content divide by 6.25.
Toril	16.03	
Finzelberg Nf. dried pepton	15.13	
Kemmereichs' Meat Pepton (fluid)	12.66	
Koch's Meat Pepton (fluid)	12.57	
Maggis bouillon extract	8.96–9.77	
Cibil's preparation	8.80–14.68	
Bios	8.57	
Antweiler's Pepton	5.85–13.41	
Fersan (J. Jolles-Wien)	3.83	
Maggis Pepton	3.33–6.55	
Cibil's Papaya Meat Pepton	2.88	
Puro	2.63	
Roborin	1.7	
Leube-Rosenthal's Beef Tea	1.2	
Kemmereich's Meat Pepton (solid)	1.10	
Koch's Meat Pepton (solid)	0.80	
Somatose	0.66	
Sanatogen	0.42	
Bovril's Preparation	0.26–14.12	
Plasmon	0.21	
Benger's Peptonized Meat Jelly (fluid)	0.16	
Hämatin-Albumin (Finsen)	0.13	
Valentine's Meat Juice	0.08	
Roborat	0.0051	
Eggs.		
Caviar (German)	6.18	
Caviar (Russian malossol)	3.0	
Hens' eggs (white)	0.31	12.3
Hen's eggs (in the shell)	0.21	13.4
Sea gull eggs	0.14	
Goose eggs	0.14	
Duck eggs	0.13	
Hen's eggs (yolk)	0.039	15.7
Milk and Dairy Products.		
Margarine	2.15	1.2
Arbora	1.01	
Butter (salted)	1.0–3.0	1.0
Condensed milk	0.40	8.8
Buttermilk	0.16	3.0
Cow's milk (full milk)	0.16	3.50
Cow's milk (skimmed milk)	0.15	3.4
Boumasche (Diabetes milk)	0.14	
Cream cheese	0.13	25.0
Whey	0.11–0.15	1.0
Fructin	0.10	
Butter (unsalted)	0.02–0.21	1.0
Palmin	0.0016	
Cheese.		
Brick cheese	10.57	
Mainzer hand cheese	4.36	
Romadour cheese	3.91	
Gervais cheese (salted)	3.43	27.6
Edam	3.30	37.1
Brie cheese	3.15	15.9
Swiss cheese	2.0	30.85
Parmesan cheese	1.93	
Chester	1.59–1.91	
Stracchino	1.0–1.3	
English cream cheese	0.7–1.15	30.1
Cheddar	0.23–1.97	27.7

	NaCl in per cent. of natural substance.	Protein per cent. Average. For nitrogen content divide by 6.25.
German cream cheese	0.20	5.2
Potted cheese	0.18	
Gervais cheese (unsalted)	0.13	27.6
Infant's Food.		
Voldmer's Mother's Milk	0.70	
Löflund's Peptonized Milk	0.65	
Epprecht's Food	0.39	
Nestles' Food	0.29	
Löflund's Peptonized Milk	0.22	
Liebes' Food in soluble form	0.14	
Rademann's Infant Food	0.03	
Kufeke's Children's Food	0.095	
Löflund's Children's Food	0.074	
Muffler's sterilized Children's Food	0.041	
Robinson's Patent Groats	Trace	

B. Vegetables and Breadstuffs.

Bread, Etc.		
Barley bread	1.38	
Army hard tack	0.95–1.60	11.1
Petit beurre (Bielefeld)	0.87	7.9
Gray bread (oats and rye)	0.71	
Wheat bread	0.70	8.0
Wheat bread (Berlin rolls)	0.69	9.4
Berlin black bread	0.66	
Graham bread	0.61	
Oat bread	0.48	
Leibnitz-Kakes	0.47	
Pumpernickel (brown bread)	0.46	
Gray bread (rye and maize)	0.40–0.68	
Waffles	0.40	
Zwieback	0.38	9.8
Aleuronat bread	0.34	
Brown bread (ammunition bread)	0.21–068	
Gray bread (⅔ rye and ⅓ white meal)	0.18–0.59	11.9
Wheat bread	0.18	8.0
Gray bread (white and rye)	0.15–0.48	11.9
Macaroni	0.067	13.4
Noodles (thin)	0.064	11.7
Cereals and Meal Products.		
Rolled oats	0.35	16.7
Hominy grits (American)	0.29	8.3
Hominy grits (German)	0.28	
Hominy grits	0.26	8.3
Sago	0.19	
Buckwheat	0.06	6.4
Quaker oats	0.082	16.7
Oats	0.046	16.1
Rice	0.039	8.6
Barley	0.037	10.5
Millet	0.024	6.6
Maize	0.019	7.0
Ricemeal	0.016	8.6
Rye	0.014	6.8
Oatmeal	0.014	16.0
Wheat	0.013	8.0–13.0
Cornmeal	0.002–0.008	9.2
Tubers.		
Potatoes	0.16–0.078	2.2

	NaCl in per cent. of natural substance.	Protein per cent. Average. For nitrogen content divide by 6.25.
Sweet potatoes	0.16	1.8
Carrots	0.06	1
Kohlrabi	0.072	2
Rutabaga	0.058	1.3
Legumins.		
Lentils	0.13–0.19	
Beans	0.09	9.0
Lentils (dried)	0.155	25.7
Peas	0.058	7.0
Vegetables (fresh).		
Spinach	0.84	2.1
Celery (stalks)	0.25–0.49	1.1
Spinach	0.17–0.21	2.1
Savoy cabbage	0.16–0.44	4.1
Lettuce	0.12	1.2
White cabbage	0.11–0.44	1.6
Tomatoes	0.11	0.9
Salads (of all kinds)	0.08–0.17	1–2
Black radishes	0.08–0.15	
Cucumbers	0.06–0.08	0.8
Cauliflower	0.05–0.15	1.8
Pumpkin	0.05	1.0
Asparagus	0.04–0.06	1.8
Winter cabbage	0.03–0.75	
Kohlrabi	0.03–0.21	2.0
Horseradish	0.02–0.06	1.4
Tomatoes	0.094	0.9
Beans (young)	0.089	
Celery root	0.083	
Radishes	0.075	1.3
Rhubarb	0.059	0.6
Peas (fresh)	0.058	
Leek	0.040	1.2
Artichokes	0.036	2.6
Carrots	0.016–0.3	1.1
Onions	0.016–0.09	1.4
Canned and Airtight Vegetables.		
Artichokes	1.27	0.8
French beans	0.83	1.1
Asparagus	0.83	1.5
String beans	0.77	1.2
Soup stock	0.76	
Peas (young)	0.67	3.6
Tomatoes	0.14	1.2
Pickled Vegetables.		
Sour gherkins	1.45	0.5
Sauerkraut	0.73	1.7
Mushrooms.		
Champignon	0.04–0.06	3.5
Yellow boletus	0.031	
Morelle	0.031	
Fruit.		
Raisins (Sultana)	0.16	2.6
Almonds (dried)	0.10	21.0
Strawberries	0.01–0.02	0.7
Currants	0.093	1.5
Pineapple	0.071	0.4
Cocoanut (milk)	0.035	0.4
Grapes	0.024	2.8
Gooseberries	0 021	

	NaCl in per cent. of natural substance.	Protein per cent. Average. For nitrogen content divide by 6.25.
Figs	0.021	4.3
Walnuts (dried)	0.019	18.4
Cherries	0.013	1.1
Watermelon	0.011	0.4
Olives	0.008–0.21	1.7
Oranges	0.0057	0.4
Apricots	0.0047	4.7
Damsons	0.0046	
Chestnuts	0.0045–0.010	6.2
Plums	0.0045	1.0
Citron	0.0045	0.5
Sweets.		
Brown sugar	0.28	
Raw sugar	0.11	
Chocolate	0.073	
Lump sugar	0.049	
Beet sugar	0.0090	
Spices.		
Mustard	2.66	
Coriander (mixed with salt)	2.1	
Pepper (black)	0.51	
Fennel	0.43	
Dill	0.41	
Marjoram	0.31	
Paprika	0.27	
Bay leaves	0.27	
Coriander (mixed with vinegar)	0.20	
Saffron	0.12	
Cinnamon	0.061	
Vanilla	0.055	
Poppy seeds	0.038	
Pepper (white)	0.019	
Alkaloid Containing Articles.		
All kinds coffee (roasted)	0.01–0.33	
Tea	0.15	
Cocoa beans	0.05–0.095	
Coffee (roasted)	0.045	

C. Beverages.

Beer (English)	0.10	
Eggnogg	0.045	
Beer (German)	0.016	
Light beer	0.015	
Champagne (Moet and Chandon)	0.0045	
Pomril	0.0027	
City main water	0.0031–0.0035	
Ale	0.0017	
Underground water	0.0012–0.006	
Spring water	0.00055–0.0046	
Table Waters.		
Seltzer water (plain)	0.23	
Namedy sparkling	0.19	
Seltzer water (sparkling)	0.10	
Sparkling Rhenser	0.125	
Vichy	0.053	
Apollinaris	0.043	
Biliner	0.039	
Fachinger	0.039	
Salvator	0.017	

D. Other Articles of Food.

	NaCl in per cent. of natural substance.	Protein per cent. Average. For nitrogen content divide by 6.25.
Soups.		
Bouillon	1.0	
Barley broth	0.9	
Bouillon	0.59–0.8	
Peas and rice soup (Maggi)	0.57	
Potato soup	0.56	
Bouillon	0.55	
Rice soup	0.54	
Tapioca-Julienne (Maggi)	0.54	
Cream soup	0.53	
Bouillon	0.49	
Gruel (Maggi)	0.34	
Milk porridge	0.25	
Wine soup The A B C of the kitchen	0.23	
Apple soup	0.015	
Meat Dishes.		
Baked tongue	1.92	
Boiled pike	1.84	
Steamed pigs' kidney	1.61	
Roast pork	1.54	
Chopped beef steak	1.29	
Baked calves' brain	1.24	
Roast veal	1.11	
Filet of beef	1.04	
Roast beef	0.98	
Mutton cutlet	0.97	
Boiled lobster	0.95	
Roast hare	0.76	
Roast chicken	0.39	
Sauces.		
Sardellan sauce	1.5	
Gravy	0.8	
Anchovy sauce	0.75	
Eggs.		
Scrambled eggs (with salt)	1.1	
Boiled eggs	0.98	
Scrambled eggs (with sugar)	0.19	
Omelet with vinegar (without salt)	0.18	
Vegetables.		
Spinach	0.91	
Morelle	0.68	
Cauliflower	0.49	
Carrots	0.46	
Salad.		
Green salad	0.41	
Preserves.		
Apple sauce	0.031	
Pear preserves	0.019	
Puddings.		
Macaroni (Italian)	1.04	12.6
Milk pudding	0.40	
Macaroni (in milk and sugar)	0.29	
Rice and apples	0.18	
Chocolate blanc-mange	0.061	
Tapioca pudding	0.027	
Tapioca pudding (without salt, sugar or spices)	0.026	

Forced Feeding.—Forced or excessive feeding is utilized with

benefit in certain diseased conditions with certain limitations (see Tuberculosis, the Rest Cure, and Diseases of the Stomach), but it is well to note that in most conditions forced feeding is productive of unsatisfactory results, and the effect on normal individuals is distinctly bad. The effect of the excessive diet is a rapid increase in weight during the period in which the individual is so fed, and general symptoms of discomfort, such as heaviness, indisposition to exercise, feeling of distention and weight in the abdomen, disturbed sleep, sometimes dyspnea on exertion, often pain in the region of the liver and, later, diarrhea, often of a severe type. There is marked increase in the inorganic constituents of the urine, the urine is increased in quantity, and there is a marked increase in the quantity of total nitrogen in the urine, the proportion passed as urea remaining normal.

Fat-free Diet.—A fat-free diet is, of course, impossible, but a diet low in fat may easily be arranged and it has been suggested in certain diseases of the stomach, particularly in catarrhs, either with or without atony and dilatation. It has also been suggested in cases in which the free hydrochloric acid is absent or greatly diminished, in cancer and in acidosis.

Tibbles gives the following list of fat-free foods: sugar, honey, syrup, starch, beef-tea, meat extracts, casein preparations, and the whites of eggs.

Foods containing 0.5 per cent. or less: Skim milk, casein powders, sugar, corn-starch, arrowroot, sago, tapioca, green peas, string beans, potatoes, parsnips, carrots, turnips, radishes, beetroot, salsify, cabbage, cauliflower, brussels-sprouts, spinach, vegetable marrow, squash, asparagus, tomatoes, mushrooms, truffles, onions, leeks, celery, lettuce, watercress, cucumber, rhubarb; apples, pears, peaches, plums, strawberries, raspberries, gooseberries, currants, muskmelons, melons, watermelons, oranges; litchi nuts; and *the white of eggs.*

Foods containing less than 1 per cent. of fat: In addition to the foregoing—fine white flour, white bread, ryemeal and rye bread, beef-tea, meat extracts, beef broth, meat stews when skimmed, tomato soup, oxtail soup, mulligatawny soup, pea soup, gumbo soup. Turtle, frog's legs, oysters, clams, scallops, crab, crayfish, shrimps. Fish: bass, cod, cusk, flounder, haddock, hake, yellow perch, perch-pike, grey pike, pickerel-pike, pollock, red grouper, and red snapper.

Foods with 1 to 2 per cent. of fat: Sole, plaice, smelt, sturgeon, weak-fish, skate, blue-fish, black-fish, king-fish. Venison: partridge, breast of boiled fowl; wheat, brown bread, wholemeal bread, buckwheat flour, macaroni, vermicelli, haricot and navy beans, dried peas, frijoles, green corn; grapes and bananas.

Protein-free Diet.—This is used to allow the elimination of waste products, as in nephritis, and also to change the character of the intestinal flora. It is a starvation diet at best, so it should only be

used a few days at a time. It is ordinarily preferable to starvation, which is sometimes employed to allow for the elimination of waste products. Care must be taken not to upset the patient's digestion by too free or injudicious use of sweets. Diets which are nearly protein free are used in practice.

Foods free from protein are the various sugars, honey, butter, and olive oil. To these may be added foods low in protein, such as all green salads, lettuce, endive, chicory, and the like; all green vegetables, as celery, sprouts, spinach, kale, tomatoes, cucumbers, cauliflower, cabbage, squash, turnips, artichoke, and the like; fruit juices, stewed fruits, and most raw fruits; berries of all kinds, melons of all kinds. To these other things may be added to give a little variety or to add to the bulk, such as chestnuts, bran, agar, and often rice is allowed and small amounts of cream, milk, or some of the milk preparations.

Carbohydrate-free Diet.—This subject is considered in the article on Diabetes.

Calcium-containing Diets.—Foods particularly rich in calcium are cheese, milk, buttermilk, cocoa, chocolate, egg yolk; hazelnuts, almonds, and other nuts; lentils, beans, and other legumes, green vegetables, as cauliflower, cabbage, chard, endive, lettuce, turnip tops, dandelions, and water-cress; figs and olives; maple syrup and molasses.

Phosphorus-containing Diets.—Foods rich in phosphorus are cheese, chocolate, cocoa, egg yolk, meat extracts, barley, oatmeal, whole wheat bread, peas, beans and lentils; peanuts and other legumes, almonds, pecans, walnuts, and other nuts.

THE DIETETIC MANAGEMENT OF SURGICAL CASES

Preparation for Operation.—Surgical operations that must be performed immediately, of course, admit of no preparation. Most operations, however, may be postponed for several days or longer, thus enabling the patient to be put in good condition by rest, preferably in bed, and a nourishing, easily digested diet. This is of great importance in nervous women, and no major operation should be undertaken, except when urgently demanded, without giving the patient the benefit of the "building-up process." A plan that seems to be popular at the present day, especially among gynecologists, is to operate first and then to build up the patient. Were this plan reversed, many operations could be avoided altogether. The truth of this is illustrated by the following case: A nervous young woman of twenty was advised by a surgeon to undergo operation for the anchoring of a movable kidney. Later she consulted an eminent physician, who prescribed rest with proper nourishment under the care of a competent nurse. In six weeks' time her gain in weight was such that the kidney became anchored in normal fat, whereas all nervous symptoms had disappeared.

The value of rest in bed is greatly augmented by massage, electricity, and baths; by tonics; and by laxatives to correct the tendency to constipation that usually exists.

Diet and Laparotomies.—One or two days previous to the operation the bowels should be cleansed thoroughly by a saline, such as sulphate of magnesia, and in the case of abdominal or pelvic operations, an enema or two may be given in addition, the object being not only to secure cleanliness, but to obtain rest for the bowels. Licorice powder may be substituted as a laxative, or in delicate patients aloes, cascara sagrada, or citrate of magnesia may be employed. The washing-out of the rectum should be performed early on the morning of the operation—at six or seven o'clock or at least three hours before the operation.

The diet on the day previous to the operation should be light. On the morning of the operation a glass of milk or a cup of very weak cocoa or beef-tea should be given. There is no objection to adding a small piece of toast, a biscuit, or a cracker. This should, however, precede the operation by at least three or four hours. If the operation is performed early in the morning, nothing need be given before it. Operation upon the gastro-intestinal tract should be preceded by the special diet given below (Diet following Operation on the Stomach).

After the operation there is usually nausea. This may be lessened or entirely prevented by a method which has been practised for some time in Halsted's service at the Johns Hopkins Hospital and in Finney's at the Union Protestant Infirmary of Baltimore in cases of ether anesthesia; namely, washing-out of the stomach after all surgical procedures while the patient is on the table and still under the influence of the anesthetic. C. S. White,[1] too, extols this method in a report, in which he shows that in a series of 20 consecutive cases, 60 per cent. did not vomit, while in 100 consecutive cases of ether anesthesia without lavage only 30 per cent. did not vomit.

As a rule, nothing should be given by mouth for twenty-four hours. Very small quantities of carbonated water or iced water or of very hot water may be given, or, if the patient is weak and in need of nourishment, milk may be given in teaspoonful doses, lime-water or a carbonated water may be added to the milk if necessary. Hot weak tea is often acceptable to the patient, and if there is need of a stimulant, strong black coffee may be administered; or if an alcoholic stimulant is desired, champagne in small doses or good brandy diluted with aërated water may be prescribed. If champagne or good brandy cannot be obtained, very old pure whisky may be used. For the first twenty-four or forty-eight hours the diet should be liquid—milk or one of the liquids given in the diet-list below. Usually from 5 to 10 ounces of food will be taken the second, and from 10 to 15 ounces the third day. On the fourth day, if there are no untoward symptoms and it is deemed advisable, a soft diet may be given. (See list below.) After a week or ten days the ordinary diet may be resumed.

Nausea and Vomiting.—This is more frequent after prolonged operations and when ether has been the anesthetic used, but can often be prevented by washing out the stomach while the patient is still under the influence of the anesthetic, as has been mentioned. Nausea and vomiting are less frequently occasioned by the drop method of producing ether anesthesia than by the method of administering large quantities, as was formerly practised. It may be transitory or may continue for days or even a week, depending on the severity of the operation and also on personal habit. The management of nausea and vomiting may become a matter of the greatest difficulty.

While the vomiting is active no food should be given by the mouth. If it persists and the patient is weak, rectal enemata may be prescribed unless contraindicated by some special operation. These may be given every six or eight hours. (See Rectal Feeding.)

Various methods for the relief of vomiting may be tried. A teaspoonful or two of hot water, to which has been added a drop of dilute of hydrocyanic acid or of tincture of capsicum to an ounce or two of water, may be effectual. Teaspoonful doses of iced champagne may be useful, as may also the following: Drop doses of creosote in

[1] C. S. White, Annals of Surgery, August, 1904.

a teaspoonful or two of lime-water; drop doses of spirits of chloroform at frequent intervals; ten or twenty minims of a 2 per cent. solution of cocain; morphin in very small doses, or bismuth subnitrate. A mustard plaster, an ice-bag, or a hot-water bag applied to the epigastrium sometimes brings relief. If the bowels have not moved, the vomiting may be relieved by an enema. A full glass of hot water frequently gives relief, and even if it is rejected it serves to wash out the stomach. Washing out the stomach with a weak boric-acid solution is often effective in checking the vomiting when all other methods fail. Total abstinence from food, drink, and medicine is the safest way to manage the majority of cases.

Thirst.—This is often a troublesome symptom; in some cases it is almost intolerable. Kelly has reported the case of a patient who drank about a quart of water from a hot-water bag placed at her feet; many similar occurrences could be cited. Clark reported from Kelly's wards the use of high enemata of saline solution to allay the thirst following operation. About a quart of solution is used. The patient *must be fully under the anesthetic* or sufficiently large quantities will not be retained. "A stiff rectal tube is inserted well up into the sigmoid flexure, and the fluid is slowly poured into a glass funnel held three feet above the patient's buttocks." While this is being done the patient's buttocks should be elevated six or eight inches, and the fluid allowed to flow well into the colon. It is very rarely expelled. Thirst can be best allayed by practicing continuous enteroclysis according to the method advised by Murphy. If this cannot be done and the thirst is intolerable, the patient may be given small quantities of plain hot water, carbonated water, or hot weak tea. The tea is often retained when water is rejected.

Care of the Bowels.—As a rule, by the third day after operation, it is desirable that the bowels be evacuated, and to this end a pill of aloes, belladonna, and strychnin or a dose of cascara or licorice powder may be given. Calomel is a favorite drug with some operators, one-tenth to one-fourth of a grain being given every half-hour or every hour until from one to three grains have been given. This may be followed by a half-glass of citrate of magnesia, a few drams of a saturated solution of sulphate of magnesia, or a dose of castor oil. If necessary, an enema may be given. Kelly gives the following formula of Dr. C. P. Noble:

℞	Magnes. sulph.	℥ij;
	Ol. terebinth.	℥ss;
	Glycerin.	℥j;
	Aqua	qs. ad. ℥iv.

Sig.—Inject into the bowel.

Not more than three enemata should be given during the entire third day.

If the patient is doing well and there are no untoward symptoms,

and if ordinary efforts do not produce a movement, no alarm need be felt even if there be no evacuation up to the sixth day. At about this time they will often move naturally.

Dietetic Management of Shock.—Much can be done, by proper management of the diet before the operation, to prevent shock. What is generally spoken of as the building-up process should be resorted to, especially when the patient is very much debilitated, before every operation that will permit it.

Following the operation, in addition to the usual means of stimulation, as the application of external warmth and the like, stimulating and nutrient enemata may be given. The first enema may be administered while the patient is on the table and still under the influence of the anesthetic. This may be repeated every three hours, or, if the patient's condition allows it, at longer intervals. Kelly recommends an enema consisting of two ounces of brandy, twenty grains of carbonate of ammonia, with sufficient water or beef-tea at 37.8° C. (100° F.) to make eight ounces. A stimulating enema of 200 c.c. salt solution and 200 c.c. of coffee is often useful.

Anesthesia and Diet.—The relation of diet to anesthesia is one deserving of study; as yet too little has been done. Hawk has shown that dogs given 3 or 4 grams of carbohydrate per kilo of body-weight failed to show any glycosuria after ether anesthesia, but the same dogs for ten days on a carbohydrate-free diet showed glycosuria. The question of post-anesthetic glycosuria would seem to be largely a question of diet, and the minimum of carbohydrate per kilogram of body-weight necessary to prevent glycosuria in the human being should be determined.

Another similar question is that of postanesthetic acidosis. We have seen various grades of acidosis, particularly following ether. Children who have been starved prior to operation seem to be especially liable. Acidosis may usually be prevented by the administration of carbohydrate food and sodium bicarbonate. We advise the use of glucose solutions or, what seems to act just as well, of cane-sugar or plain candy three times a day for three days before operation, especially in children. The equivalent of two or three lumps of sugar at a time with from one-fourth to a teaspoonful of sodium bicarbonate. We have never seen a case of postanesthetic acidosis where this has been done. Where it has developed, the administration of glucose solutions by rectum by the Murphy drop method should be tried. Thirty grams (1 ounce) of glucose may be dissolved in 1 liter (quart) of normal salt solution or in water may be utilized for this purpose. (See Acidosis.)

In general, the following plan may be adopted with satisfactory results in all cases where an anesthetic is to be administered and circumstances permit it to be carried out. The day preceding the operation the patient should keep quiet; the bowels should be thor-

oughly emptied by means of a saline, and the diet should be light and easily digestible. The supper should be a light one, and nothing but water should be given for six hours at least before operation if possible; but water may be given freely up to the time of operation. *At the time of anesthesia the stomach should be empty!* This has a tendency to lessen the nausea that is apt to follow the operation, and prevents vomiting while the operation is in progress. If the stomach contains food and vomiting occurs, the vomited material may be drawn into the larynx and cause choking or severe coughing, or it may be drawn into the lungs and cause pneumonia. The vomiting and coughing may, besides, interfere materially with the progress of the operation.

If it is necessary to administer an anesthetic after a full meal and circumstances permit, an emetic may be given to empty the stomach before operation is begun, or it may be better to wash out the stomach.

Nausea is apt to follow after anesthesia, particularly after the administration of ether; this has been discussed in a previous paragraph. Food should not be hurried after an operation. A patient suffers less from too little food than too much. If nausea does not occur, a cup of weak tea or of diluted milk may be given two or three hours after the operation, and if that is retained, milk may be given as often as every three hours if desired. For supper, bread and milk or cocoa or a slice of toast and a cup of tea may be allowed. It is well, however, to wait until the following day before giving anything more. On the following day, if there is no nausea or other untoward symptoms, a light breakfast may be given, and after that as rapid a return to an ordinary diet as circumstances will allow may be made.

Diet and Chloroform Anesthesia.—From observations on animals Davis and Whipple[1] found that chloroform injury was greatest in starved animals, and that diets rich in sugar and other carbohydrates exert a marked protective influence, while fat alone or diets rich in fat cause a susceptibility to injury comparable with starvation. Skeletal muscle and heart muscle had a slight protective influence, while beef extract was highly protective in proportion to its food value, and the parenchymatous organs, such as liver and kidney, exert a considerable amount of protection. Brain, although rich in lipoidal substances, is a protective food, thus being in marked contrast to fat mixtures. Skimmed milk alone and commercial casein alone or with cracker meal are highly protective. Gelatin has little protective action. Epinephrin and quinin sulphate given on the days preceding the chloroform exert a marked protective action.

Patients who are to take chloroform should be given a diet rich in carbohydrate and milk for at least two days before chloroform anesthesia. Chloroform should not be given to fasting patients. After

[1] Archives Internal Medicine, xxxiii, 1919.

chloroform injury to the liver, if the patient survive, diets rich in casein—*i. e.* milk, carbohydrates, gelatin, and meats—may be given to facilitate regeneration.

DIET AFTER OPERATION

There are many erroneous views concerning the diet suitable after operations. These views are held not only by many surgeons of large practice, but by physicians and hospital men as well. Fortunately, the day is passing when the surgeon considers his duty done when he removes his operating gown. There are still hospitals, however, where much of the after-treatment of operations is delegated to untrained men, who, often fresh from the lecture-room, are uncertain as to what diet the patient should receive, and therefore leave this entirely to the nurse.

The diet following operations should be supervised by the surgeon himself or by an assistant who has been especially trained for the purpose. In operations about the mouth, as for harelip, and on the alimentary tract, the management of the diet is often of as much importance as the operation itself. Hans Kehr maintains that the diet is as important a part of the technic after operations as the sterilizing of hands and instruments is before it. On account of the difficulty of maintaining a proper diet at home, owing to the interference of well-intentioned but misguided friends, he refuses to operate at the home of the patient except when transportation is out of the question.

It should be remembered that confinement to bed for weeks after an operation greatly impairs the nutrition, and every effort should therefore be made to select operations that reduce the period of confinement to bed as much as possible. The patients should be allowed to get up as soon as practicable, if only to sit in a wheel-chair, and so make airing more easy. Many ingenious devices have been invented for maintaining comfortable positions and at the same time permitting the patient to be moved about. The Gatch bed is devised to allow the patient to change his position and gives great comfort on this account. In some cases massage and electricity may be employed, and whenever it is possible the patient should be in the fresh air a part of the time. Wherever feasible the bed may be rolled to a sun parlor or to a porch to supply the necessary light and air. When this is done marked improvement in the nutrition of the patient follows.

In patients who are up and about no especial diet is, as a rule, necessary, except after operations on the mouth, larynx, or alimentary tract. The diet should be as simple and nutritious as possible—usually that of the ordinary individual. Diabetics do best on the diet advised for diabetes, and on such a diet healing may be facilitated, whereas on an ordinary diet it may progress but slowly or not at all. Gouty and dyspeptic patients should receive especial attention, as has been directed in a previous section. Vegetarians

should gradually be returned to a mixed diet—indeed, a few weeks' stay in a hospital may serve to cure them from the folly of pursuing such a diet. Children should be fed as directed in the section on the Feeding of Infants and Children, and in all cases, where the condition permits, the child should be accustomed to the diet of the hospital before the operation, or the results of improper feeding may be wrongly attributed to the operation and much harm result.

In all cases the individual should be carefully studied as regards his habits and nutrition. It is surprising to see how the condition improves and the appetite returns when the patient is properly fed.

Diet No. I—Feedings Every Two Hours

Time.		Amount.	Protein, grams.	Fat, grams.	Carbohydrate, grams.	Calories.
7 A. M.	Hot milk	200 c.c.	6.6	8.0	10.0	138.40
9 A. M.	Oatmeal gruel	100 c.c.				
	With milk	100 c.c.	4.5	4.4	11.3	102.80
	Coffee with cream	25 c.c.				
	With cane sugar	8 gm.	0.55	10.0	8.75	127.2
11 A. M.	Orange juice	50 c.c.				
	Lemon juice	25 c.c.				
	Lactose	50 gm.				
	Water	150 c.c.	0.4	0.1	58.25	235.5
1 P. M.	Chicken broth	150 c.c.	5.4	0.5	2.25	35.10
	Cocoa	5 gm.				
	With lactose	30 gm.				
	With cream	50 c.c.				
	With milk	100 c.c.	5.48	25.44	38.38	404.40
3 P. M.	Buttermilk	200 c.c.	6.0	1.0	9.58	71.32
5 P. M.	Grape juice	125 c.c.				
	With lactose	25 gm.	......	......	31.25	125.00
7 P. M.	Cream of tomato soup	150 c.c.	10.65	42.64	41.05	590.56
	Soft-cooked egg	50 gm.	5.95	4.65	......	65.55
9 P. M.	Hot milk	150 c.c.	4.95	6.0	7.50	103.80
			50.48	102.93	212.06	1999.73

Time.	From the kitchen.	Amount.	From the floor.	Amount.
7 A. M.	....	......	Hot milk	1 glass.
9 A. M.	Oatmeal gruel with milk	1 serving		
	Coffee with cream and sugar	1 cup		
11 A. M.	....	......	Orangeade with lactose	1 glass.
1 P. M.	Chicken broth	1 bowl		
3 P. M.	....	......	Buttermilk	1 glass.
5 P. M.	Cream soup	1 bowl		
	Soft-cooked egg	1 egg		
7 P. M.	....	......	Grape juice with lactose.	1 glass.
9 P. M.	....	......	Hot milk	1 cup.

DIET No. II—FEEDINGS EVERY TWO HOURS

Time.		Amount.	Protein, grams.	Fat, grams.	Carbohydrate, grams.	Calories.
7 A. M.	Chicken broth	100 c.c.	3.6	0.1	1.5	21.30
9 A. M.	Soft-cooked egg	50 gm.	5.95	4.65	......	65.65
	Oatmeal gruel	100 c.c.	1.2	0.4	6.3	33.60
	Coffee with cream	25 c.c.				
	and sugar (cane)	8 gm.	0.55	10.0	8.75	127.20
11 A. M.	Grape juice	150 c.c.	......	......	37.50	150.0
1 P. M.	Cream of green pea soup	200 c.c.	15.56	56.88	88.04	806.32
	Orange juice	50 c.c.				
	With lemon juice	25 c.c.				
	With lactose	50 gm.				
	With water	150 c.c.	0.4	0.4	58.25	235.80
3 P. M.	Beef juice	100 c.c.	4.90	0.60	......	25.0
5 P. M.	Malted milk	12 gm.				
	With cocoa	5 gm.				
	With lactose	25 gm.	4.13	4.30	4.01	191.26
	Soft poached egg	50 gm.	5.95	4.65	......	65.65
7 P. M.	Boiled custard	100 gm.	6.27	6.32	31.35	207.36
9 P. M.	Barley water	200 c.c.	0.52	0.11	3.64	17.63
			49.03	88.11	239.34	1946.47

Time.	From the kitchen.	Amount.	From the floor.	Amount.
7 A. M.	....	......	Chicken broth	1 cup.
9 A. M.	Oatmeal gruel	1 serving		
	Soft-cooked egg	1 egg		
	Coffee with sugar and cream	1 cup		
11 A. M.	....	......	Grape juice	1 glass.
1 P. M.	Cream soup	1 bowl		
	Orangeade	1 glass		
3 P. M.	....	......	Beef juice	1 cup.
5 P. M.	Chocolate malted milk	1 glass		
	Soft poached egg	1 egg		
7 P. M.	Boiled custard	1 cup		
9 P. M.	....	......	Barley water	1 cup.

Those habituated to the daily use of alcohol for years should receive a moderate average amount, lest nutrition be interfered with or delirium develop. The amount should be the minimum required to secure results, but should not be so low as to defeat the purpose for which it is given.

Vaughan and Van Dyke[1] have published tables of postoperative dietaries in use at St. Elizabeth Hospital, Richmond, Va. They are made upon a basis of 2000 calories, with a protein intake slightly below 1 gram per kilogram of average body weight. For limited periods the reduction of protein intake to as low as 29 grams per day

[1] Postoperative Dietotherapy, American Journal of Medical Sciences, February, 1922, p. 272.

Diet No. III—Feedings Every Two Hours

Time.		Amount.	Protein, grams.	Fat, grams.	Carbo-hydrate, grams.	Calories.
7 A. M.	Orange juice	100 c.c.	0.8	0.2	28.07	117.28
	Lemon juice	15 c.c.				
	Lactose	15 gm.				
9 A. M.	Cream toast	30 gm.				
	With milk	100 c.c.				
	With butter	1 oz.				
	With flour	1 oz.	7.78	12.49	7.45	173.33
	Poached egg	50 gm.	5.95	4.65	.....	65.65
11 A. M.	Chicken broth	100 c.c.				
	With cracker	10 gm.	4.58	1.01	8.81	62.65
1 P. M.	Cream of pea soup	200 c.c.	15.56	56.88	58.04	806.35
3 P. M.	Oatmeal gruel with milk	100 c.c.	8.72	8.10	21.83	195.10
5 P. M.	Poached egg on toast	20 gm.	7.87	13.39	10.54	194.15
	Butter	10 c.c.				
7 P. M.	Baked custard	100 gm.	7.60	6.65	12.50	140.25
9 P. M.	Malted milk	12 gm.				
	With cocoa	5 gm.				
	With lactose	25 gm.	10.39	11.56	48.07	237.88
			69.25	114.93	195.93	2092.81

Time.	From the kitchen.	Amount.	From the floor.	Amount.
7 A. M.	....	......	Orangeade with lactose	1 glass
9 A. M.	Cream toast	1 serving		
	Poached egg	1 egg		
11 A. M.	....	......	Chicken broth with cracker	1 glass
1 P. M.	Cream soup	1 bowl		
3 P. M.	Oatmeal gruel with milk	1 serving		
5 P. M.	Poached egg on toast with butter	1 serving		
7 P. M.	Baked custard	1 serving		
9 P. M.	....	......	Chocolate malted milk	1 glass

is without deleterious effects. The caloric intake provides for a slight gain in weight. The diets are rather high in carbohydrates.

"Diet No. I is usually the first administered, and should be given as soon after operation as the patient's condition safely permits. It corresponds to the so-called liquid diet, although there are included in it such non-liquids as strained oatmeal gruel and a soft-cooked egg. Diet No. II is used interchangeably with the former and is particularly useful in those cases with milk intolerance or with a tendency to abdominal distention. Diet No. III follows Diet No. I or No. II usually by about two days. When it is found that the patient tolerates the first diet well he may rapidly be changed to the third. In this

DIET No. IV—FEEDINGS EVERY TWO HOURS

Time.		Amount.	Protein, grams.	Fat, grams.	Carbo-hydrate, grams.	Calories.
7 A. M.	Baked apple	120 c.c.	0.61	0.58	29.30	124.86
9 A. M.	Wheat farina	100 c.c.				
	With milk	100 c.c.				
	With lactose	15 gm.	14.50	5.40	96.30	491.0
	Toast with milk	100 c.c.				
	Toast	40 gm.	7.12	12.54	7.10	169.74
11 A. M.	Plain junket	100 gm.	3.30	4.0	19.67	127.88
1 P. M.	Creamed fish	50 gm.	17.48	18.83	26.24	344.35
	With white sauce	100 c.c.				
	Purée of spinach	100 gm.	2.10	4.10	2.60	55.70
3 P. M.	Apricot souffle	.....	6.37	21.56	17.85	290.92
5 P. M.	Chicken broth	100 c.c.				
	With rice	50 gm.	5.0	0.60	1.50	31.40
	Poached egg	50 gm.				
	On toast	20 gm.				
	With butter	10 c.c.	7.87	13.39	10.54	194.15
7 P. M.	Stewed prunes	100 gm.	0.50	0.10	22.30	92.10
9 P. M.	Barley gruel with milk	120 gm.	5.94	6.41	13.25	134.45
			70.59	87.51	246.65	2056.55

Time.	From the kitchen.	Amount.	From the floor.	Amount.
7 A. M.	Baked apple	1 large		
9 A. M.	Wheat farina with sugar and milk	1 serving		
	Milk toast	1 serving		
11 A. M.	Plain junket	1 cup		
1 P. M.	Creamed fish	1 serving		
	Purée of spinach	1 serving		
3 P. M.	Apricot souffle	1 serving		
5 P. M.	Chicken broth with rice	1 bowl		
7 P. M.	Stewed fruit	1 serving		
9 P. M.	Barley gruel with milk	1 serving		

the feedings are alternated, liquid and semisolid. After an additional day or two, or as long as is necessary in each individual case, Diet No. IV is given, consisting of semisolid food.

"The feedings in all four diets are administered every two hours. The directions to the nurse are simplified as shown in the accompanying tables, which indicate the amount to be given and whether it is to come from the kitchen or is to be made up by the nurse in the ward.

"The advantages of these four groups of diets are as follows: (1) A graduated increase in feedings is provided for each uncomplicated case; (2) the diets are composed of the proper proportions of protein, fat and carbohydrate; (3) the nourishing value is high; (4) all diets are sufficiently varied and are palatable.

"In practical experience we have found the diets to be satisfactory. No striking advantage over the usual method of feeding is to be seen in the average postoperative case. It is particularly in those cases which develop untoward complications with prolonged convalescence that the comparative advantages become apparent. Nevertheless, we have observed that patients placed on these dietaries are much more content than others treated by the usual method."

Diet and Wound Healing.—Wound healing has a close relation to the diet. Cellular activity is more marked on diets rich in protein, so that the diet of individuals with healing wounds, if conditions allow, should be rich in protein and certain sufficient fat. On diets deficient in protein and rich in carbohydrate healing is delayed, and, when established, takes place slowly. This has been worked out experimentally in carefully controlled animals.

Diet After Operations About the Head.—Following all injuries or operations about the head the diet should be carefully regulated. For the first few days the diet should be light if the brain has been affected—usually liquid—and as nutritious and as easy of digestion as it is possible to make it.

The bowels should be kept open. No alcohol should be allowed except in the case of habitués, and these should receive the minimum amount based on their previous daily average. If the patient is unconscious or unable to swallow, he should be fed with the nasal or stomach-tube or rectal feeding may be instituted.

After brain operations, when there are no unusual symptoms, the diet should be liquid for the first two or three days and then a semi-solid or even an easily digestible solid diet may be allowed. Milk-toast, junket, bouillon and egg, soft-boiled or poached eggs, squab, chicken, and the like are allowable. The diet should be light but sufficient in quantity until the patient is up and about, when the amount may be increased until a nearly normal diet is taken.

In operations of a plastic nature about the face, where the taking of food or vomiting is apt to open the wound, the food should be given by the rectum until all danger of vomiting is past and until the patient can masticate or swallow without fear of injuring the part. It should be remembered that wounds about the mouth are often very easily pulled apart.

Diet after Harelip or Cleft-palate Operations.—Following these operations especial attention to the diet is necessary. The child should be sent to the hospital several days or even weeks before the operation, in order to accustom him to the attendants, to the hospital feeding, and to teach him to take nourishment from a spoon or by means of a long medicine-dropper. If the patient is an infant, it should receive the diet on which it is increasing in weight. If breast milk is to be given, it should be taken from the breast with a breast-pump and fed to the infant with a spoon. The greatest cleanliness

should be observed, and the technic of preparing and preserving the milk should be carefully carried out, and only sterile food should be given for four days. The infant should not be allowed to suck too soon, for fear of breaking open the wound.

In all mouth operations the diet should consist of cold sterilized milk or modifications of milk until solid food can be taken. Rectal feeding or feeding by means of a nasal tube may be used as a temporary expedient.

Diet after Esophageal Operations.—Following esophagotomy rectal feeding may be employed, or the patient may be fed with a nasal or a stomach-tube until he is able to swallow without pain. The food should be of liquid or semisolid consistence until the wound has healed, except when the patient may be trusted to masticate all food very thoroughly. If the food is regurgitated through the wound or if it passes out on swallowing, the feeding had better be accomplished by means of a tube, or rectal feeding may be instituted for several days.

Diet after Excision of the Larynx.—The diet after this operation is a matter of great importance. Formerly great difficulties were encountered, and gastrotomy was often resorted to as a means of furnishing food to the patient. With improvement in technic this may now usually be dispensed with. (The student is referred to the textbooks on surgery for an account of the improved technic.)

The length of time that must be allowed to elapse after the operation before the patient can be permitted to swallow is dependent upon the patient's condition. Graf operated upon a patient who was able to swallow on the day following the operation. The length of time varies ordinarily from four days to eight weeks or longer. During this time rectal feeding may be employed at the outset, or the nasal or the stomach-tube may be used. Some operators insert a tube in the esophagus and allow it to remain there for days. It may be passed through the mouth or the nose. This method has been strongly condemned and is not in general use.

Diet after Operations about the Gall-bladder or Liver.—Following operations upon the gall-bladder, where a fistula has been made, the food should consist largely of the proteins and carbohydrates. The fats are not well borne, and for this reason it is well to eliminate them so far as possible from the dietary. Water is the first thing of importance and should be forced. It has been demonstrated that if a patient suffering with gall-bladder disease does not void at least 500 c.c. of urine in twenty-four hours mental symptoms are almost certain to develop.

Diet after Operations about the Pancreas.—The functions of the pancreas, with the exception of furnishing a fat-splitting enzyme, can be assumed and carried on by the other glands. The diet does not differ from that advised for other abdominal operations, but it may be well to limit the consumption of fats. The use of artificially pan-

creatized food has been suggested. This is a subject that requires further investigation.

Diet after Operations about the Kidney.—In all operations about the kidney the diet should be so arranged as to make the work of elimination as easy as possible for the organ. This may be accomplished by a diet such as has been prescribed in chronic or even in acute nephritis. All irritating substances, in particular, should be avoided.

Diet after Operations on the Stomach.—In preparing patients for operations on the stomach the fact that such individuals are often emaciated and weakened by long-continued illness must constantly be borne in mind; on this account such patients should, wherever possible, be "built up" for at least a week before operation. In order to accomplish this result as much digestible food as the patient can consume should be given him. It should be offered to him in as appetizing and in as concentrated a form as possible; as a rule, only small quantities at frequent intervals should be given.

If necessary, rectal alimentation should be practised; in individuals who are anemic and very weak, the use of a salt infusion the day previous to the operation is advisable. In all operations on the stomach it is most important that the organ be as sterile as possible, and also entirely empty before the operation. Since the noteworthy experiments of Cushing and Livingood,[1] by which these investigators established the fact that an amicrobic state can be produced in the stomach and small intestine, Finney, as well as other surgeons, has taken advantage of this fact in his surgical procedures on the stomach.

By washing out the stomach thoroughly with sterile water twice daily and feeding the patient on a sterile diet the stomach may be kept free from micro-organisms. Finney advises the following procedure:

For two days following the operation nourishment is administered by means of rectal alimentation. Normal salt solution and glucose and soda enemata are given at four-hour intervals or, better, continuous feeding by means of the drop method is practised. On the third day after operation egg-albumin is given in teaspoonful doses, gradually increased to ½ ounce every two hours if well borne, and finally to 1 ounce every two hours on the fourth day and 2 ounces on the fifth day. On the seventh day any liquid is permissible, and on the ninth day the patient is given a soft-boiled egg; on the tenth and eleventh days soft diet with dry toast. On the fifteenth day very restricted light diet; on the sixteenth day a restricted light diet, and on the eighteenth day very light solid food.

Surgeons differ markedly in their views regarding the time that should be allowed to elapse after operations on the stomach before mouth-feeding is begun. Some, as Czerny, allow eight days to elapse,

[1] Johns Hopkins Hospital Reports, vol. ix.

whereas others, as von Eiselberg, give very light food, such as milk, the day following the operation. According to Kehr,[1] the following regulations as to diet should be maintained after operations on the stomach:

"1. After operation, the diet should be regulated at first from hour to hour, then from day to day.

"2. Strong, healthy individuals may be allowed to go without food as long as their general condition warrants it.

"3. The more extensive the operation, the more care should be exercised with the diet.

"4. Patients weakened by cancerous growths may be allowed liquid food as soon as the effect of the anesthetic has worn off.

"5. An exact knowledge of the motor as well as the secretory functions of the stomach will indicate the proper method of feeding in these cases."

FINNEY AND FRIEDENWALD'S DIET LIST FOLLOWING OPERATIONS ON THE STOMACH

First day: Nothing by mouth; enemata of normal salt solution with glucose and soda or, better, continuous feeding by the Murphy method.

Second day: Water by mouth, increasing from 1 dram gradually to 1 ounce every two hours.

Third day: Water 1 ounce, alternating with albumin 1 dram.

Fourth day: Increase albumin to 1 ounce; water to 2 ounces.

Fifth day: Water 3 ounces every two hours, alternating with albumin 2 ounces. Discontinue rectal feeding.

Sixth day: Water ad libitum, alternating with albumin 2 ounces.

Seventh day: Water ad libitum; any liquid except milk.

Eighth day: Any liquid 4 ounces every two hours.

Ninth day: Any liquid 4 ounces every two hours and soft-boiled egg.

Tenth day: Soft diet.

Eleventh day: Soft diet and dry toast.

Twelfth day: Soft diet and dry toast.

Thirteenth day: Soft diet and dry toast.

Fourteenth day: Soft diet and dry toast.

Fifteenth day: Very restricted light diet.

Sixteenth day: Restricted light diet.

Seventeenth day: Restricted light diet.

Eighteenth day: Any digestible solid food.

After the eighteenth day the following diet list may be gradually followed, and should be continued for at least four or five months: Soups; any light soup. Meats; any of the easily digestible meats, as brains, sweetbreads, beef, mutton, lamb, or poultry (best minced, and taken either broiled or boiled). Fish; mainly the white variety, mackerel, rock bass, as well as oysters (boiled or broiled). Eggs; in any form except fried. Vegetables; best taken mashed and strained; the easily digestible forms as asparagus, spinach, peas, beans, potatoes, carrots. Farinaceous food; any of the cereals; bread to be taken stale. Desserts; any of the light puddings. Fruits; mainly stewed. Fatty food; cream, butter and olive oil. Drinks; milk, buttermilk, cocoa, carbonated mineral waters and plain water.

The following must be avoided: Rich soups, fried foods, pork, veal, stews, hashes, corned meat, potted meat, twice cooked meat, liver, kidney, duck, goose, sausage, crabs, sardines, lobster, preserved fish, smoked fish, salted fish, salmon, cauliflower, celery, radishes, cabbage, cucumbers, sweet potatoes, tomatoes, beets,

[1] Leyden's Handbuch der Ernährungs-Therapie, 2d edition, vol. ii, p. 555.

corn, salads, bananas, melons, berries, pineapple, hot bread, or cakes, nuts, candies, pies, pastry, preserves, cheese, strong tea, strong coffee, alcoholic stimulants.

Diet after Operations on the Intestine.—In operations on the upper portion of the intestine the dietetic regulations are similar to those previously described under Operations on the Stomach; food may, however, be given by the mouth earlier than after operations on the stomach. The food should be of such a nature as will not leave too solid a residue in the bowels; it must also vary according to the pathologic condition present, as well as according to the extent of the surgical procedure.

After an ordinary appendix operation the patient may be given liquid food on the second day after operation; on the third day a soft diet may be allowed, and on the fifth or sixth day solid food may be taken; on the other hand, if the operation has been a serious one, with pus-formation and a gangrenous appendix, he may be required to be fed exclusively by rectal enemata for five or six days or more, and then liquids given, but milk should not be allowed for some days, until the other liquids are borne without difficulty.

The cause of death after gastric and intestinal operations, according to F. Ehrlich,[1] is not so much shock as exhaustion, brought on by starvation before and after the operation. To prevent this he feeds his patients immediately after the ether nausea has worn off, and he feeds them well.

He feeds his patients by a routine method in the following manner: So soon as the nausea from the anesthetic has worn off, the patient gets tea, red wine or gruel; on the day after the operation he is given sweetbread in bouillon, even if it nauseates him; if the nausea is persistent his stomach is washed. On the second day, finely chopped, cooked squab, chicken or veal is added; on the third day, beef, potato purée, and cakes; on the fourth, chopped ham (raw), soft zwieback, and soft-boiled eggs; on the fifth day, white bread and spinach. After the seventh day the meat is not chopped and then the patient returns gradually to normal diet. The bowels are regulated with oil enemas. The shock of the operation does not usually last beyond the third day.

After operations on the rectum the patient is kept on a fluid diet for from four to five days; after this a soft diet is given, and finally, in six or seven days, solid food may be prescribed.

Feeding through Gastric or Intestinal Fistulas.—After gastric or intestinal fistulas have been made, the patient may, if necessary, be fed through these openings as early as a few hours after the operation. It is best at first to give only very small quantities of liquids at frequent intervals. Kehr advises alternately, every two hours, one-half cup of tea with cognac, milk, and egg, and, on the second day, wine with peptone. He adds bouillon with an egg on the third day, and begins with "mushy" food, such as potato soup, flour soups with egg,

[1] Münchener Medinische Wochenschrift, 1904, ii., 614, No. 14.

beef-tea with minced breast of chicken on the eighth day. After three weeks the patient may be allowed to masticate his food, and then, by means of a rubber tube, pass it into the stomach through the fistula.

Diet in Pancreatic Fistula.—Heineke has pointed out that in persistent fistula following operation on the pancreas, where there is maceration of the skin due to the action of the pancreatic secretion, Wohlgemuth's method of dieting gives satisfactory results. Wohlgemuth found that the amount of fluid discharged from the pancreas depended on the composition of the food taken by the patient. With fatty diet the secretion was very scanty, and with an albuminous diet it increased on the addition of carbohydrates and became very abundant. Secretion is increased by acids and diminished by alkalis. Bicarbonate of soda in small, frequently repeated doses is perhaps the best method of administering alkalis in these cases.

ARMY AND NAVY RATIONS

ARMY RATIONS

By the term ''ration'' is meant the sum-total of the daily allowance of food issued by a government to its soldiers and sailors. Candles and soap also form part of the ration. Computation of the quantities of the various component parts of the ration is greatly facilitated by the use of the ''Army Ration Issue and Conversion Tables,'' which show, almost at a glance, the amounts required for any number of rations from 1 to 50,000.

The subject of army rations has received careful study. The subjoined tables, taken for the most part from articles on army diet by Major Charles E. Woodruff, of the United States Army, give a summary of the rations furnished the various armies of the world.

The ration in times of peace is easily arranged. Whether or not the soldier is well fed will depend largely on the commander and the cook of the company. Each soldier is required to do his own cooking, except in garrisons, when certain men are detailed for that duty. If the cook is energetic and skilful, he will be able so to arrange the diet as to give the men sufficient variety; if, in addition to the regular ration, there are a kitchen-garden at the army post and a well managed ''savings fund,'' the company should live very well indeed. On the other hand, if the cook is unskilful or lazy, and if there is neither kitchen-garden nor savings fund to draw upon, the company will receive a monotonous or even an injurious diet. The ''savings fund'' is made up of the money obtained from the sale of unused rations. That part of the ration which is not utilized is resold to the commissary, and the money so obtained is expended by the commander of the company for table luxuries. The fund is augmented by the profits of the ''Post Exchange,'' which is a sort of general store where tobacco, lunches, and the like are sold. The amount and variety of food supplied are set forth in the following tables,[1] compiled by Woodruff from observations made by him at Fort Assiniboine, Montana:

Percentage of Waste.

Bacon	1.40	
Pork	8.00	only 9 pounds were reported, but this was increased in 31 pounds, to include bones, etc.
Bread	3.30	Crusts and small unavoidable wastes.
Beef	22.50	$19\frac{3}{4}$ bone, $2\frac{3}{4}$ fat, and other wastes.

[1] Woodruff, The Journal of the American Medical Association, December 3, 1892, p. 651.

Uncooked Food of Garrison Rations for Ten Days. Weights in Pounds. Daily Average, 440.4 Men.—(Woodruff.)

	Gross weight.	Waste.	Net weight.	Water.	Protein.	Fats.	Carbo-hydrates.	Salts.	Calories.
Bacon	273¾	3¾	270	54.00	21.60	187.65	. . .	6.75	831,600
Beans	428½	. . .	428½	54.05	99.10	8.57	253.80	13.29	691,228
Pork	343¾	31	312¾	37.85	2.82	259.00	. . .	13.14	1,097,753
Sugar, brown	731	. . .	731	21.93	. . .	. . .	705.42	3.66	1,312,081
Flour	4,379	126½	4,252½	531.56	467.78	46.78	3185.12	21.26	6,991,110
Beef	5,025	1131	3,894	2196.70	682.97	978.38	. . .	35.95	5,409,392
Potatoes	5,116	1386	2,730	2943.00	78.33	3.73	667.67	37.30	1,398,750
Onions	700	150	550	481.80	7.70	1.65	55.55	3.30	123,750
Oatmeal	44	. . .	44	3.34	6.65	3.13	30.01	0.88	81,400
Cornmeal	85	. . .	85	12.75	7.82	3.23	60.01	1.19	139,825
Apples, canned	10	. . .	10	8.32	0.02	0.04	1.59	0.03	3,150
Apples, dried	183	. . .	183	46.85	1.65	3.30	130.85	2.57	259,494
Tapioca (26) and cornstarch (13)	39	. . .	39	0.78	. . .	. . .	38.14	0.08	70,980
Butter	58	. . .	58	6.09	0.58	49.30	0.29	1.74	209,670
Syrup	165	. . .	165	70.60	. . .	. . .	90.60	3.80	168,795
Lard	107½	. . .	107½	12.90	0.65	89.66	. . .	4.30	383,775
Rice	26	. . .	26	3.22	1.92	0.14	20.65	0.14	42,380
Corn, canned	63	. . .	63	51.22	1.77	0.70	8.32	0.38	21,735
Tomatoes, canned	332	. . .	332	318.72	2.66	1.33	8.30	1.00	26,560
Macaroni (51) and vermicelli (1½)	52½	. . .	52½	6.88	4.73	0.15	40.32	0.42	73,815
Milk, fresh	31	. . .	31	25.61	1.58	1.50	2.00	0.31	12,552
Milk, condensed	31	. . .	31	7.75	5.27	3.41	13.64	0.93	49,442
Cheese	10½	½	10	3.50	3.30	2.20	0.50	0.50	16,000
Prunes	35	20	15	10.00	0.75	. . .	4.00	0.25	3,500
Cabbage and sauer-kraut	250	50	200	182.00	4.20	0.60	11.00	2.20	31,000
Ham	32	4	28	11.63	4.68	11.00	. . .	0.76	54,880
Apricots	20	. . .	20	13.50	0.40	. . .	6.00	0.12	9,200
Barley	5	. . .	5	. . .	0.65	0.14	3.80	0.15	9,000
Peas	4½	. . .	4½	0.55	1.20	0.08	2.54	0.12	7,043
Raisins	14	4	10	6.45	0.05	. . .	3.50	0.08	6,153
Chocolate	3	. . .	3	0.48	0.60	1.50	0.30	0.12	7,950
Totals	18,598	2908¾	15,689¼	7120.50	1413.21	1657.17	5343.66	154.82	19,446,960
	Pounds.			Grams.					
Daily average per man	4.22	.66, 15½ p. c.	3.56, 85½ pc.	733	145	171	550	16	4,416
Counting flour as bread, amount eaten	. . .	. . .	. . .	45	9	11	34	1	
is 4 lb. per man. Per cent. of am't eaten					145	171	550	34	
Including Table V. (salts only) grams	. . .	. . .	. . .	733					
Including estimated amounts in Tables V. and VII.	5	¾	4¼ (2.8 lb. water free)						

Potatoes	27.09	Parings and defective ones.
Onions	21.04	" " " "
Prunes	33.00	Stones and other wastes.
Cabbage	45 00	
Ham	12.00	Estimated.

Additional Articles Consumed.

	Daily per man.	Allowance.	
338 lbs. green coffee	1.23 ounces.	1.60 ounces.—Or	
8 lbs tea	0.03 ounce.	0.32	
20 gallons vinegar	0.14 gill	0.32 gill	Allowance is large to allow of making a saving to be used in making sauer-kraut and pickles in the fall.
10 lbs. pepper	0.036 ounce.	0.04 ounce...	
11 bottles flavoring extract.			
3 lbs. mustard.			
24 lbs. baking-powder.			
6 lbs. currants.			
5 gallons pickles.			
4 kegs pickled pigs' feet			Though containing much energy, it is omitted because composition is unknown, and the actual amount per man is very small.

Consumption and Allowance per Man.

	Daily per man.	Allowance.	
4379 lbs. flour	15.91 ounces.	18 ounces.	Includes purchases.
4946½ lbs. bread	17.97 "	18 "	
343¾ lbs. pork	1.34 "	1.2 "	
273¾ lbs. bacon	1.00 ounce.	2.4 "	
5025 lbs. beef	18.30 ounces.	18.0 "	
5116 lbs. potatoes	18.50 "	12.8 "	80 per cent. of vegetables.
700 lbs. onions	2.50 "	3.2 "	20 per cent. of vegetables.
428½ lbs. beans	1.50 "	2.4 "	
763 lbs. sugar	2.70 "	2.4 "	
64 lbs. butter	2.00 "	..	
137 lbs. lard	0.50 "	..	
15 gallons syrup	0.40 gill.	..	

A ration is the allowance for the subsistence of one person for one day. The garrison ration is intended for troops, whenever practicable, in time of peace, also in time of war, except for those beyond the advance depots; the haversack ration is intended for troops beyond the advance depots; the travel ration is for troops traveling otherwise than by marching, and separated from cooking facilities; the Filipino ration, for the use of Philippine scouts; and the emergency ration, for troops in active campaign, for use on occasions of emergency or in the field for purposes of instruction.

The commanding officer will determine which of the several prescribed rations is appropriate for the particular service to be performed, and will direct the use of the same.

When in the exigencies of the service troops are subsisted on the haversack ration, and it is found to be practicable to supplement these stores by local purchases or by shipments, the commanding general may direct, in written orders, the issue in kind, in addition to the haversack ration, of such available articles of food not in excess of the amounts allowed of corresponding articles in the garrison ration.

The United States is the only nation that furnishes the entire ration to the soldiers. The following tables were taken from the general orders, No. 60, of the United States War Department, issued May 8,

1. *Garrison Ration.*

Component articles and quantities.		Substitutive articles and quantities.	
Beef, fresh	20 ounces	Mutton, fresh	20 ounces.
		Bacon[1]	12 ounces.
		Canned meat, when impracticable to furnish fresh meat	16 ounces.
		Hash, corned beef, when impracticable to furnish fresh meat	16 ounces.
		Fish, dried	14 ounces.
		Fish, pickled	18 ounces.
		Fish, canned	16 ounces.
		Turkey, dressed, drawn, on Thanksgiving Day and Christmas, when practicable	16 ounces.
Flour	18 ounces	Soft bread	18 ounces.
		Hard bread, to be ordered issued only when the interests of the government so require	16 ounces.
		Cornmeal	20 ounces.
Baking powder	0.08 ounce		
Beans	2.4 ounces	Rice	1.6 ounces.
		Hominy	1.6 ounces.
Potatoes[2]	20 ounces	Potatoes, canned	15 ounces.
		Onions, in lieu of an equal quantity of potatoes, but not exceeding 20 per cent. of total issue.	
		Tomatoes, canned, in lieu of an equal quantity of potatoes, but not exceeding 20 per cent. of total issue.	
		Other fresh vegetables (not canned) when they can be obtained in the vicinity or transported in a wholesome condition from a distance, in lieu of an equal quantity of potatoes, but not exceeding 30 per cent. of total issue.	
Prunes	1.28 ounces	Apples, dried or evaporated	1.28 ounces.
		Peaches, dried or evaporated	1.28 ounces.
		Jam, in lieu of an equal quantity of prunes, but not exceeding 50 per cent. of total issue.	
Coffee, roasted and ground	1.12 ounces	Coffee, roasted, not ground	1.12 ounces.
		Coffee, green	1.4 ounces.
		Tea, black or green	0.32 ounce.
Sugar	3.2 ounces		
Milk, evaporated, unsweetened	0.5 ounce		
Vinegar	0.16 gill	Pickles, cucumber, in lieu of an equal quantity of vinegar, but not exceeding 50 per cent. of total issue.	
Salt	0.64 ounce		
Pepper, black	0.04 ounce		
Cinnamon	0.014 ounce	Cloves	0.014 ounce.
		Ginger	0.014 ounce.
		Nutmeg	0.014 ounce.
Lard	0.64 ounce		
Butter	0.5 ounce	Oleomargarin	0.5 ounce.
Syrup	0.32 gill		
Flavoring extract, lemon	0.014 ounce	Vanilla	0.014 ounce.

[1] In Alaska, 16 ounces bacon, or, when desired, 16 ounces salt pork, or 22 ounces salt beef.

[2] In Alaska the allowance of fresh vegetables will be 24 ounces instead of 20 ounces, or canned potatoes, 18 ounces instead of 15 ounces.

NOTE.—Food for troops traveling on United States Army transports will be prepared from the articles of subsistence stores which compose the ration for

1911. There are very slight changes from the rations as given in our previous editions:

"The kinds and quantities of the component articles of the army ration and the substitutive equivalent articles which may be used in place of such components shall be as follows:

2. *Haversack or Reserve Ration.*

Component articles and quantities.		Substitutive articles and quantities.	
Bacon	12 ounces	. . . .	
or meat canned	16 ounces	. . . .	
Hard bread	16 ounces	. . . .	
Coffee, roasted and ground	1.12 ounces	. . . .	
Sugar	2.4 ounces	. . . .	
Salt	0.16 ounce	. . . .	

3. *Travel Ration.*

Component articles and quantities.		Substitutive articles and quantities.	
Soft bread	18 ounces	Hard bread	16 ounces.
Beef, corned	12 ounces	Hash, corned beef	12 ounces.
Beans, baked	4 ounces	. . . .	
Tomatoes, canned	8 ounces	. . . .	
Jam	1.4 ounces	. . . .	
Coffee, roasted and ground	1.12 ounces	. . . .	
Sugar	2.4 ounces	. . . .	
Milk, evaporated, unsweetened	0.5 ounce	. . . .	

4. *Filipino Ration.*

Component articles and quantities.		Substitutive articles and quantities.	
Beef, fresh	12 ounces	Bacon	8 ounces.
		Canned meat	8 ounces.
		Fish, canned	12 ounces.
		Fish, fresh	12 ounces.
Flour	8 ounces	Hard bread	8 ounces.
		Soft bread	8 ounces.
Baking powder, when in field and ovens are not available	0.32 ounce	. . . .	
Rice, unpolished	20 ounces	. . . .	
Potatoes	8 ounces	Onions	8 ounces.
Coffee, roasted and ground	1 ounce	. . . .	
Sugar	2 ounces	. . . .	
Vinegar	0.08 gill	. . . .	
Salt	0.64 ounce	. . . .	
Pepper, black	0.02 ounce	. . . .	

troops in garrison, varied by the substitution of other articles of authorized subsistence stores, the total cost of the food consumed not to exceed 24 cents per man per day, except on Thanksgiving Day and Christmas, when not to exceed 39 cents, is authorized.

"One day in each alternate month of the season of practical instruction, not exceeding three days in each year, the use of the haversack ration with individual cooking will be required by all troops in the field for purposes of instruction.

"Scout organizations will be required to use the entire allowance of the meat component, and not more than 16 ounces of rice per day to be used for each ration. The purchase of 1.6 ounces of beans per ration in substitution of the portion of the rice ration not drawn will be made, and use of as large an extent as possible of native products, such as camotes, mangoes, and squash, will be required."

The food supplied the soldiers in training at the cantonments has been made the subject of a short study by Murlin (Science, May 24, 1918, p. 495). On an average routine the 3,700 calories were actually consumed, while the average soldier of five feet, eight inches, carrying his equipment and walking at the rate of three miles an hour required 4,100 for a thirty mile walk. For faster rates the amount of food needed rapidly increased. The following figures on page 784 show the nature and amount of food actually used.

It is interesting to compare the above with the rations supplied the Allies. The table on page 785 is taken from Murlin's article:

Concerning the selection of a ration Woodruff says: "An army must be fed at a great distance from the market, and it is therefore evident the chief objects in view in the selection of the soldier's food must be facility of transportation and ease of preservation in all climates. Articles that are bulky or easily damaged by rough handling, and those that are not easily preserved from decay, are at once ruled out. It need scarcely be mentioned that the articles must be produced in abundance throughout the country, neither imported nor the particular preparations of a few manufacturers. Couple with this the fact that the articles must be so inexpensive as to refute any charges of extravagance, and it will be readily understood that with a few exceptions the ration contains about all the articles that it is possible to put in at present without calling on foods that are preserved, canned, or otherwise specially prepared."

For the reasons just stated Woodruff says that the soldier's ration has always been simple and dry. There was but little change in the army ration until recent years. In arranging the ration for an army there are a number of matters that require careful consideration. An army in a cold climate can not thrive on the same diet that an army in the tropics would do well on, and *vice versâ.* In a cold climate any article that will be spoiled by freezing must be eliminated from the dietary. This excludes potatoes, fresh vegetables, canned goods that are in fluid form, and the like.

The subject of diet for soldiers in the tropics is one of great interest. Food that excessive heat will spoil or that can not easily be

Page from Statistical Report of Food Consumption in the Training Camps.

	Food per Man per Day.				Consumed Distr. of Fuel Value, Per cent.	Wasted, Per Cent.	Per Man per Day
	Nutrients	Supplied	Wasted	Consumed			
			Camp Travis.				
0042	Protein, gm.	117	15	102	14	13	Consumed cost, 37 c.
90th Div., Caisson No. 1,	Fat, gm.	101	18	83	25	18	Waste cost, 5 c.
11/7–13/17	Carbohydrate, gm.	519	54	465	61	10	Total waste, .50 lb.
	Fuel value, cal.	3,547	450	3,097	100	13	Edible waste, 22 lb.
0043	Protein, gm.	135	5	130	13	4	Consumed cost, 37 c.
90th Div., Co. A, 357 Inf.,	Fat, gm.	185	6	179	40	3	Waste cost, 1 c.
11/8–14/17	Carbohydrate, gm.	505	16	489	47	3	Total waste, .50 lb.
	Fuel value, cal.	4,345	142	4,203	100	3	Edible waste, .15 lb.
0044	Protein, gm.	85	3	82	15	4	Consumed cost, 31 c.
90th Div., Co. B, 357 Inf.	Fat, gm.	68	3	65	26	4	Waste cost, 1 c.
	Carbohydrate, gm.	346	10	336	59	3	Total waste, .37 lb.
	Fuel value, cal.	2,399	81	2,318	100	3	Edible waste, .13 lb.
			Ft. Sam Houston				
0040	Protein, gm.	112	4	108	17	4	Consumed cost, 40 c.
Base Hosp. Det. Mess.	Fat, gm.	105	6	99	34	6	Waste cost, 2 c.
11/4–10/17	Carbohydrate, gm.	333	12	321	49	4	Total waste, .36 lb.
	Fuel value, cal.	2,801	121	2,680	100	4	Edible waste, .19 lb.
			Wadsworth				
0068	Protein, gm.	170	4	166	16	2	Consumed cost, 49 c.
27th Div., Bat. E, 106 FA.	Fat, gm.	187	7	180	38	4	Waste cost, 2 c.
12/5–11/17	Carbohydrate, gm.	507	15	492	46	3	Total waste, .82 lb.
	Fuel value, cal.	4,515	143	4,372	100	3	Edible waste, .46 lb.
0069	Protein, gm.	151	8	143	14	5	Consumed cost, 42 c.
27th Div., Co. I, 12 NY.	Fat, gm.	126	5	121	26	4	Waste cost, 3 c.
Inf., 12/6–13/7	Carbohydrate, gm.	674	42	632	60	6	Total waste, .95 lb.
	Fuel value, cal.	4,554	252	4,302	100	6	Edible waste, .68 lb.
0070	Protein, gm.	118	9	109	14	8	Consumed cost, 36 c.
27th Div., Co. I, 106 Inf.,	Fat, gm.	89	4	85	25	4	Waste cost, 3 c.
12/6–12/17	Carbohydrate, gm.	516	38	478	61	7	Total waste, .90 lb.
	Fuel value, gm.	3,428	230	3,198	100	7	Edible waste, .58 lb.

Comparison of Allies' Rations

Ration	Weight				Fuel value				Distribution		
	Total	Protein	Fat	Carbo-hydrates	Protein	Fat	Carbo-hydrates	Total	Protein	Fat	Carbo-hydrates
	Gm.	Gm.	Gm.	Gm.	Cal.	Cal.	Cal.	Cal.	%	%	%
British Field	1,461	143	154	440	586	1,432	1,804	3,822	15.3	37.5	47.2
British Field and Trench	1,893	144	174	463	590	1.618	1,898	4,106	14.3	39.4	46.3
Canadian, Oct. 1, 1917..	1,860	151	182	460	619	1,693	1,886	4,198	14.7	40.3	45.0
Canadian Diet No. 40..	622	132	127	363	541	1,181	1,488	3,210	16.9	36.8	46.3
French, Normal	1,261	141	89	467	578	828	1,915	3,321	17.4	24.9	57.7
French, Reserve	1,091	112	114	385	460	1,063	1,580	3,103	14.8	34.3	50.9
French, Strong	1,362	152	97	509	623	902	2,087	3,612	17.2	25.0	57.8
Italian Combating	1.366	142	67	519	582	623	2,128	3,333	17.5	18.7	63.8
Italian Territorial	1,116	94	50	415	385	465	1,701	2,551	15.1	18.2	66.7
U. S. Garrison	1,935	175	125	671	718	1,163	2,751	4,632	15.5	25.1	59.4
U. S. Garrison, Modified	1,803	166	178	657	681	1,655	2,694	4,809	13.5	32.9	53.6
Average, 87 messes....	1,940	139	130	536	570	1,209	2,198	3,997	14.3	30.4	55.3

preserved by ignorant men must be avoided. The ration should be so arranged that it may readily be changed to suit the climate. It has been abundantly proved by our army in the Philippines that men living quiet lives in the tropics eat less than they would in a cold or temperate climate. This difference is particularly marked in the consumption of meat and fatty substances. If, however, an army is undergoing very active service with excessive labor and resulting fatigue, the meat allowance will have to be correspondingly increased to make up for the wear and tear of the muscular system. Major Kean is quoted as follows in the report of the Surgeon-General of the United States Army, 1900, p. 201:

"He premises that a tropical dietary, as compared with one suited to a colder climate, should have less fat and more carbohydrates, less stimulating proteins in the form of meat, a greater variety of diet both of meats and of carbohydrates in the form of fresh vegetables and fruits, and, lastly, a fairly liberal supply of ice. His argument for the substitution of carbohydrates for fats is that the digestion is weakened in hot climates and the liver is inclined to torpidity, while ingested fats are prone to split up into butyric, caproic, and other irritating acids, which the diminished secretion of the liver is unable to neutralize. As intestinal digestion cannot proceed in the presence of acidity, the condition known as biliousness is established, with putrefaction of the intestinal contents and the production of various harmful alkaloid substances. A catarrhal inflammation of the bowel results, with diarrhea, which is at first of advantage in eliminating the harmful substances, but which under the continued irritation of unsuitable diet is liable to continue and become aggravated. As to a lessened use of meat, he cites the dietary customs of the inhabitants of hot climates, who get their proteins less from meat than from the leguminosæ. The appetite is lessened by long and continued heat and becomes capricious. It craves variety, especially in vegetables and fruits, and these he claims cannot be had on the basis of our present ration. The need of ice to furnish a cool drinking-water and to preserve the perishable constituents of the ration is regarded as obvious."

An admirable essay on "The Ideal Ration for an Army in the Tropics," by Captain Edward L. Munson, appeared in the Boston Medical and Surgical Journal for May, 1900. Munson thinks that the present ration is very well chosen as to its nutrient properties, but that it should be rearranged for use in the tropics, and he suggests the following tables for tropical dietaries:

Tropical Dietary I.

Articles.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value, calories.
Fresh beef	10.0	44.75	. . .	41.68	6.67	590
Flour	18.0	5.60	380.46	55.08	7.90	1850
Beans	2.4	1.22	40.18	15.16	2.42	240
Potatoes	16.0	0.45	81.70	9.50	1.52	380
Dried fruit	3.0	1.53	33.80	1.77	0.27	220
Sugar	3.5	. .	94.25	. .	. .	397
Total	52.9	53.55	630.39	123.19	18.78	3677

Total carbon, 395.14 grams; nitrogen to carbon, 1 : 19.6.

The following table gives a proposed dietary suitable for the tropics, and especially applicable to field service; in this the fatty constituents attain their maximum and the potential energy is high:

Tropical Dietary II.

Articles.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value, calories.
Bacon	6.0	105.06	. . .	15.64	2.49	1042
Hard bread	18.0	6.62	371.81	73.12	11.74	1926
Beans	2.4	1.22	40.18	15.16	2.42	240
Dried fruit	3.0	1.53	50.70	1.77	0.27	220
Sugar	3.5	. .	94.25	. .	. .	397
Total	32.9	144.44	556.94	105.69	16.92	3825

Total carbon, 328.76 grams; nitrogen to carbon, 1 : 23.

The nutrient value of the ordinary dietary as proposed for garrison duty in the tropics is as follows:

Tropical Dietary III.

Articles.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value, calories.
Fresh beef	10.0	44.75	. . .	41.68	6.67	590
Soft bread	20.0	6.80	299.20	53.83	8.61	1506
Potatoes and onions	16.0	0.72	73.09	8.60	1.40	340
Dried fruit	3.0	1.53	50.70	1.77	0.27	220
Sugar	3.5	. .	94.25	. .	. .	397
Total	52.5	53.80	517.24	105.88	16.95	3053

Total carbon, 328.76 grams; nitrogen to carbon, 1 : 18.

For the following combination the several articles of the ration most closely approaching in character the food materials used by natives of the tropics, proportioned in quantity according to the standard proposed for hot climates, have been selected:

Tropical Dietary IV.

Articles.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value, calories.
Fresh fish (cod), whole	14 0	0.79	. . .	31.73	5.07	120
Soft bread	20.0	6.80	299.20	53.83	8.61	1506
Rice	4.0	0.45	88.87	8.75	1.40	407
Potatoes and tomatoes	16.0	0.54	65.80	8.17	1.36	297
Dried fruit	3.0	1.53	50.70	1.77	0.27	220
Sugar	3.5	. .	94.25	. .	. .	341
Total	64.5	10.11	598.82	104.25	16.71	2947

Total carbon, 327.50 grams; nitrogen to carbon, 1 : 19.6.

On averaging these four dietaries, as furnished by the ration proposed for the tropics, the mean nutrient composition is seen to be as follows:

Dietary.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value. calories.
I.	52.9	53.55	630.39	123.19	18.78	3677
II.	32.9	114.44	556.94	105.69	16.92	3825
III.	52.5	53.80	517.24	105.88	16.95	3053
IV.	64.5	10.11	598.82	104.25	16.71	2947
Average	50.7	37.97	560.85	109.06	17.34	3375

Total carbon, 350 grams; nitrogen to carbon, 1 : 20.

It will be observed that while these four dietaries differ considerably from one another, yet when averaged together in equal proportions they do not vary greatly from the nutritive standard for the tropics already proposed—and this is an additional reason why the same articles of diet should not be selected from day to day. It is seen that the foregoing average dietary, as compared with the proposed nutrient standard, is still slightly deficient in fats and fuel-value and a trifle in excess as regards protein. These discrepancies, however, if they may be considered as such, are readily overcome by using Dietary II. twice, whereas Dietaries I., III., and IV. are each employed but once. The results of this change are as follows:

Dietary.	Quantity, ounces.	Fats, grams.	Carbo-hydrates, grams.	Protein, grams.	Nitrogen, grams.	Fuel-value, calories.
I.	52.9	53.55	630.39	123.19	18.78	3677
II.	32.9	114.44	556.94	105.69	16.92	3825
II.	32.9	114.44	556.94	105.69	16.92	3825
III.	52.5	53.80	517.24	105.88	16.95	3053
IV.	64.5	10.11	598.92	104.25	16.71	2947
Average	47.1	69.43	572.06	108.38	17.26	3465

Total carbon, 363.33 grams; nitrogen to carbon, 1 : 21.

Another point to be remembered is that if the change in diet is made gradually, men can be accustomed to live on almost any food, whereas rapid changes in the diet are not well borne and are apt to be followed by illness.

The army ration should not be planned with a view to keeping a soldier on the smallest possible amount of food at the least possible expenditure of money. His diet should be such as will maintain him in the best physical condition, regardless of the varied circumstances under which he may be compelled to live. There is no economy in underfeeding soldiers. In all wars the number of sick and of those dead from disease due to improper food is larger than that due to the enemy's bullets.

Many theories and opinions regarding what constitutes the best food for a soldier have been advanced. On one point, however, all are agreed, and that is that the diet should be varied and should be so arranged as to allow of substitution of various articles, so that the ration may be varied to suit the changing conditions. This variation should be made by the commander, on the spot where the army is located, and not by some one unacquainted with the exact surroundings and needs of the men. Owing to the carelessness or ignorance of commanders, a monotonous, disease-producing fare is often furnished, when the food might easily be varied and rendered suitable. A well-selected dietary presupposes a competent commanding officer.

The dryness and sameness of the food of soldiers doubtless are responsible for much of the drunkenness that occurs among them.

When the troops are in permanent camp, within reach of markets, and when the facilities for cooking have been properly arranged, practically the same ration as is supplied in the garrison may be used. When at a distance from the base of supplies and with no available market, the food must be of such a nature as to allow it to be easily transported in the supply wagons. When on the march, the diet is essentially the same as when at a distance from the base of supplies. If possible, food may be purchased on the way from the company's fund, but if the march is through a wilderness, either pork or bacon must be used. On account of its ease of preparation, bacon is usually chosen. Captain Spurgin, quoted by Woodruff, gives the following method of using pork on the march, a method whose practicability was tested by him in the Indian campaign, when he followed the enemy for hundreds of miles: "As soon as camp was made, a fire was started and the pork was thoroughly boiled. This was put away to cool and was used the next day. At the same time some soup stock which was carried along was made into soup for dinner. Whenever it was convenient and bones could be secured, enough soup stock was made by prolonged boiling to last several days. Beans were prepared by cooking them overnight." Hard bread and coffee are also used, and prepared chocolate and dried

fruit have likewise been recommended. Experiments have been made with various materials for emergency rations, among them being dried meat of various kinds, and grain mixtures that could be eaten with or without cooking.

Various prepared foods are also used. In the German Army "Erbwurst" is highly esteemed. This is a mixture of peameal, fat, bacon, herbs, onions, etc., put up in the form of small sausages. It is manufactured in the Government factories, the secret for making

Composition of Certain Prepared Military Foods.

	Water.	Protein.	Fat.	Carbo-hydrates.	Wood-fiber.	Ash.	Authority.
Erbwurst	12.09	31.18	3.08	47.50	. .	6.15	Blythe.
Erbwurst as first used	. .	16.00	35.00	27.00	. .	. .	Parkes.
Erbwurst (1887)	. .	15.70	23.00	. .	. .	. .	"
Dried pea soup (1)	7.58	16.93	8.98	53.44	1.34	11.73	König.
Dried pea soup (2)	8.08	15.81	24.41	36.78	1.69	13.53	"
Kopf's pea soup (used by the English army)	4.78	21.00	17.25	46.45	4.40	6.03	S. P. Sharpless, Boston.

it having been purchased by the German Government from the inventor for $25,000. If used too continuously, it is liable to produce flatulence and diarrhea, and a strong dislike for it is engendered. Its chief value lies in the fact that it is lighter and more easily transported than most any other form of food, and that it is easily prepared for use. English soldiers object to it on account of its seasoning, but employ similar preparations of pea soup.

Comparison of Foods of Soldiers with Various Other Dietaries.

	Grams.				Grains.	
	Protein.	Fats.	Carbo-hydrates.	Calories.	Nitrogen.	Carbon.
German soldier (peace footing)	114	39	480	2800	277	4443
Fully fed tailors, England	131	39	525	3055	318	4862
Travel ration, U. S. A.	135	132	400	3400	328	5194
Machinist (Connecticut)	105	147	399	3435	255	5145
Factory operatives (Massachusetts)	114	150	522	4000	277	6048
Factory operatives (French Canadians, Mass.)	118	204	549	4630	287	6901
German war ration (extraordinary)	157	285	331	4650	382	6750
U. S. garrison ration (including canteen)	152	180	570	4621	370	6805
Same (including beer)	155	180	633	4907	377	7446
U. S. field ration (average)	85	280	500	5000	206	7247
Machinist (Massachusetts)	182	254	617	5640	442	8423
Teamsters, hard work (Massachusetts)	254	363	826	7805	617	9950

In addition to the foregoing, either tea or coffee must be supplied. It must be borne in mind that the emergency rations are to be used only when necessary, and that they are not to be relied upon for any length of time. They may contain the proper proportions of protein, etc., but they are dried foods, and their bulk is too small. It

is impossible to compress sufficient food into a small compass, and consequently condensed foods of any kind are of little value.

At the present day, the preservation of food has reached a degree of perfection when almost every variety of food can be preserved for use. Where transportation facilities permit, these may be used, but they are bulky and do not withstand the extremes of climate nor rough handling.

RATIONS OF FOREIGN ARMIES

The student is referred to the article by Major Woodruff in the Medical Record, May, 1899, page 701, from which the accompanying table is taken.

The United States and Foreign Army Rations Compared.—(Woodruff.)

Nation.	Ration.	Proteins.	Fats.	Carbo-hydrates.	Calories.	Remarks.
		Gm.	*Gm.*	*Gm.*		
1. England	1. Home	93	61	244	1938	No. 1.
	2. Foreign station or under canvas at home	111	80	244	2175	
	3. March	120	80	327	2550	
	4. War — Maximum	165	128	425	3634	No. 2.
	4. War — Minimum	133	92	425	3204	
	Sometimes 2 ounces of rum	. .	. .	. .	175	
2. Spain	1. Peace — Maximum	147	87	588	3729	No. 3.
	1. Peace — Minimum	120	62	500	3421	
	2. War, on march or in the field — Maximum	131	94	522	3327	No. 4.
	2. War, on march or in the field — Minimum	113	55	485	2550	
	Sometimes 1.7 oz. brandy	. .	. .	. .	150	
3. Austria	1. Peace	155	125	504	3865	No. 5.
	2. War	165	130	504	3952	
4. Italy	1. Garrison	111	130	600	4129	No. 6.
	2. Camp	115	133	600	4163	
	3. Marching	125	143	600	4307	
	Usually wine added	. .	. .	. .	250	
5. Germany	1. Small rations and portions in garrison and cantonments — Maximum	150	40	703	3947	No. 7.
	1. Small rations and portions in garrison and cantonments — Minimum	99	40	502	2827	
	2. Large rations and portions on march or in manœuvers — Maximum	172	62	915	4961	
	2. Large rations and portions on march or in manœuvers — Minimum	138	57	644	3744	
	3. Field — Maximum	195	151	703	4786	
	3. Field — Minimum	78	75	515	3413	
	Commanding general may add 3½ ounces of whisky	. .	. .	. .	268	
6. United States	1. By law — Maximum	183	260	621	5368	No. 8.
	1. By law — Minimum	105	103	500	3712	
	2. Usually in field (by law) — Maximum	106	320	540	5166	
	2. Usually in field (by law) — Minimum	64	240	460	4722	
	Average	85	280	500	5000	
	3. Food actually eaten in cold climate, moderate work, including all extras from garden and purchases	155	180	597	4907	
7. France	War — Maximum	183	300	690	5455	No. 9.
	War — Minimum	146	127	520	4015	
	Add $2\frac{1}{10}$ ounces of brandy	. .	. .	. .	184	
8. Russia	1. Peace — Maximum	233	114	976	5884	No. 10.
	1. Peace — Minimum	165	65	746	4450	
	Add 3 ounces of wine	. .	. .	. .	223	
	2. War — Maximum	174	62	805	4583	No. 11.
	2. War — Minimum	149	50	640	3307	
	Add 4½ ounces of wine	. .	. .	. .	362	

There are so many factors to be taken into consideration that it will be impossible to analyze here the rations supplied the different armies. Americans, on account of the higher plane of activity on which they live, require the stimulating effects of an abundance of fresh meat. In Europe fresh meat is expensive, and for this reason the nitrogen is largely supplied in the form of peas, beans, cheese, etc. In the Russian ration the percentage of meat is somewhat low, but the deficiency is made up by bread.

As stated elsewhere, the United States is the only government that furnishes the entire ration. Other nations supply part in food, the remainder being purchased by the soldier out of his pay or out of an allowance made him. These methods are suitable in thickly populated countries, but cannot be employed for soldiers on the frontier. Foreign soldiers, especially Germans, receive boxes from home to piece out the ration, and the purchasing power of money for extras is greater in Europe than on our frontier. The Austrian ration, which is greatly increased for field duty, is said to be the most liberal in the world. The Italian ration, considering the climate, is liberal, but may be regarded as somewhat deficient in nitrogen. The Spanish ration is said to supply a greater variety than any other.

In Russia and France the rations are considered liberal. Wine is issued in the war rations of the principal European armies, and in France this may be replaced by an allowance of cognac. The American soldier formerly could buy reasonable quantities of beer at the army canteen.

REMARKS

No. 1: This is starvation diet, and the extra food needed for health is purchased and charged against the solider (about six cents a day), increasing, perhaps doubling, the food value.

No. 2: Can be greatly changed to suit climate.

No. 3: Sufficient for such a mild climate and very moderate work.

No. 4: Varies enormously according to class of rations issued. Very many extra allowances of money for food.

No. 5: This is augmented by four cents a day for vegetables, etc. On the march a limited emergency ration is used. The war ration is so insufficient that commanders of armies or smaller forces may change, supplement, or even double it.

No. 6: Allowances of one-fifth of a cent a day for condiments; occasional extra money allowances for food. Excepting the protein, it is a very liberal diet for so mild a country.

No. 7: This is what the government may supply. Usually the soldier feeds himself and is given seven cents a day or more to reimburse him for the outlay. The food eaten is more than this deficient diet allows.

No. 8: Maxima due to fats if all the bacon is used and no meat. The entire ration is supplied and intended to be eaten.

No. 9: Peace ration not stated. It is purchased as needed and charged against the soldier. War ration is subject to great augmentation for increased work or cold climate. The commanding officer may augment ration on the march.

No. 10: Also allowed money to buy one-half to one and one-half ounces extra meat, and one to one and one-half cents for vegetables, salt, butter, lard, and groceries.

No. 11: Extra meat and spirits may be ordered by the commander-in-chief.

NAVY RATIONS

It was a notorious fact that in former days the monotonous and ''dead'' character of the food on board ship led to nutrition disorders, especially scurvy, and in recent times hard tack and salt meat have been utilized to a large extent. Never before in the history of the navy has as much attention been paid to the selection, preparation, and serving of food. In place of the poorly prepared, monotonous diet of former days the sailor is served with the following ration:

''Naval Act, June 29, 1906.—*Provided,* That sections fifteen hundred and eighty and fifteen hundred and eighty-one, Revised Statutes, be amended to read as follows:

''Sec. 1580.—The Navy ration shall consist of the following daily allowance of provisions to each person: One pound and a quarter of salt or smoked meat, with three ounces of dried or six ounces of canned or preserved fruit, and three gills of beans or pease, or twelve ounces of flour; or one pound of preserved meat, with three ounces of dried or six ounces of canned or preserved fruit and eight ounces of rice or twelve ounces of canned vegetables, or six ounces of desiccated vegetables; together with one pound of biscuit, two ounces of butter, four ounces of sugar, two ounces of coffee or cocoa, or one-half ounce of tea and one ounce of condensed milk or evaporated cream; and a weekly allowance of one-quarter pound of macaroni, four ounces of cheese, four ounces of tomatoes, one-half pint of vinegar or sauce, one-quarter pint of pickles, one-quarter pint of molasses, four ounces of salt, one-half ounce of pepper, one-eighth ounce of spices, and one-half ounce of dry mustard. Seven pounds of lard, or a suitable substitute, shall be allowed for every hundred pounds of flour issued as bread, and such quantities of yeast and flavoring extracts as may be necessary.

''Sec. 1581.—The following substitution for the components of the ration may be made when deemed necessary by the senior officer present in command: 'For one and one-quarter pounds of salt or smoked meat or one pound of preserved meat, one and three-quarter pounds of fresh meat or fresh fish, or eight eggs; in lieu of the articles usu-

ally issued with salt, smoked or preserved meat, one and three-quarter pounds of fresh vegetables; for one pound of biscuit, one and one-quarter pounds of soft bread or eighteen ounces of flour; for three gills of beans or pease, twelve ounces of flour or eight ounces of rice or other starch food, or twelve ounces of canned vegetables; for one pound of condensed milk or evaporated cream, one quart of fresh milk; for three ounces of dried or six ounces of canned or preserved fruit, nine ounces of fresh fruit; and for twelve ounces of flour or eight ounces of rice or other starch food, or twelve ounces of canned vegetables, three gills of beans or pease; in lieu of the weekly allowance of one-quarter pound of macaroni, four ounces of cheese, one-half pint of vinegar or sauce, one-quarter pint of pickles, one-quarter pint of molasses, and one-eighth ounce of spices, three pounds of sugar, or one and a half pounds of condensed milk, or one pound of coffee, or one and a half pounds of canned fruit, or four pounds of fresh vegetables, or four pounds of flour.

" 'An extra allowance of one ounce of coffee or cocoa, two ounces of sugar, four ounces of hard bread or its equivalent, and four ounces of preserved meat or its equivalent shall be allowed to enlisted men of the engineer and dynamo force who stand night watches between eight o'clock postmeridian and eight o'clock antemeridian, under steam.' "

"Naval Act, March 2, 1907.—Any article comprised in the navy ration may be issued in excess of the authorized quantity, provided there be an underissue of the same value in some other article or articles."

The above ration is not so much an expression of what the sailor should have, as what he wants.

As Gatewood aptly remarks, "Contentment in naval service in relation to food and water makes for good discipline, and contentment without work is impossible. . . . Contentment facilitates voluntary enlistment, and a service that supplied protein food in amounts exactly to meet the requirements of the body as evolved from the mathematics of nitrogenous equilibrium would not secure contentment. That is the basis of the daily amounts of food in the navy ration, the amounts depending essentially not upon what it is thought men ought to eat, but upon what experience has demonstrated they desire to eat."

The navy ration must be viewed from the very practical point of giving efficient service, and it should be sufficiently elastic to vary with the tastes of the men and to life under the varying conditions under which the sailor lives. The diet in the tropics will differ from that in the cooler regions just as the appetite and metabolism vary with the changing temperature, degrees of light, and humidity. It is not very well understood at present, but it is quite probable that

the surface nerves react to external influences, and thus affect the metabolism to a great extent.

Selection of food is of great importance, and much can be done by having a variety of different perserved and canned meats, fruits, and vegetables.

The nutritive value of navy rations is difficult to compare, as it must take into account whether it refers to the entire ration as issued or as it is consumed, or as it may be modified by way of commutation. Exact information is difficult to obtain, but a comparison of our ration with that of other nations has been made as correctly as possible, with the limitations indicated by Surgeon J. D. Gatewood, to whom I am indebted for the following table:

Naval Dietaries.	Eaten.			Digestible.			Utilizable fuel value.	Nutritive ratio.
	Protein.	Fat.	Carbohydrates.	Protein.	Fat.	Carbohydrates.		
	Gm.	Gm.	Gm.	Gm.	Gm.	Gm.	Cals.	1
1. U. S. Navy (sea ration)	138	269	556	127	256	540	5180	8.7
2. U. S. Navy (fresh provisions)	145	135	444	134	129	431	3563	5.3
3. U. S. Navy (usual)	142	192	492	131	183	478	4256	6.7
4. U. S. Navy (engineer force)	182	218	624	168	207	606	5174	6.3
5. Japanese Navy (average)	126	56	607	116	53	589	3430	6.1
6. French Navy (average)	170	34	524	156	32	508	3078	3.7
7. French Navy (engineer force)	184	35	608	169	33	590	3407	3.9
8. British Navy (average)	127	110	601	117	104	583	3891	7.2
9. British Navy (engineer force)	175	149	728	161	141	706	4938	6.6

The figures in the above table relating to the French Navy should be accepted with not a little reservation, as in the data obtainable it is not clear that all necessary factors have been included or that *any* allowance for waste is made. It is probable that the ration is given as *issued* and not as *consumed.* In regard to the Japanese Navy, it may be noted that the average weight of the enlisted men seems to be about 129 pounds.

It may be considered that the average man in the United States Navy consumes daily 142 grams of protein, 193 grams of fat, and 492 grams of carbohydrates with a fuel value of 4256 calories. The engineer forces are given an additional ration *as issued* of 42 grams of protein, 27 of fat, and 139 of carbohydrate, which makes the engineer force receive more protein than is given in Atwater's Standards for a man at very hard muscular labor.

The navy ration must be studied from several points of view, viz., its acceptability to the people who are to consume it, and this, perhaps, for reasons stated above, comes first; its availability and its

keeping qualities and its storage, besides the all-important question of securing the proper amount of nutriment within a fixed daily cost per person. All of these and other questions are considered in an excellent article by J. D. Gatewood in his work on Naval Hygiene, to which the reader desiring more extended information is referred.

The following regulations, taken from the General Mess Manual and Cook Book for Use on Board Vessels of the United States Navy, 1902, gives many interesting facts concerning the organization and management of the mess:

PART I.—THE GENERAL MESS

Organization and Administration.—1. The general messing system is, by the regulations, obligatory on board of all vessels of the navy. The mess must include all enlisted men of the navy and marine corps, excepting chief petty officers and officers' servants, and its members are to be divided into messes of about twenty men each, and as nearly as possible messed by divisions instead of by ratings, as has heretofore been the custom. By this method the petty officers will be scattered among the messes and there can be no complaint on account of discrimination—all faring alike.

2. A messman is to be detailed for each mess, and he is to receive the food from the cooks at the galley, serve it at the mess table, and is responsible for the care and the cleanliness of the mess gear and mess tables.

3. The chief commissary steward, or commissary steward, the cooks and bakers, together with the storekeeper (when a store is established on the ship), form the enlisted force of the commissary department. They are the assistants of the pay officer and belong to the pay division.

4. The responsibility of the commissary and his assistant ceases with the delivery of the food to the messmen at the galley.

5. The established rate of pay being sufficient to secure the services of competent and experienced men, the payment of any gratuity, either by the commissary or by the men themselves, to any person employed in the service of the general mess is forbidden by the regulations.

6. The commanding officer should see that proper facilities, including such boats and men as may be necessary, are afforded the commissary for getting mess stores on board and stowing them.

7. It should be thoroughly understood that the general mess is not an organization managed by its members, as was the "berth-deck mess."

8. In addition to the pay provided for enlisted men, the Government undertakes to subsist them, and this it does at whatever expense may be necessary. The fixed value of commutation for one ration is, by law, 30 cents, but the commutation of rations is a privilege, not a right, and the idea prevalent among enlisted men that they are entitled to receive just 30 cents' worth of food each day, or 30 cents in money, is erroneous.

9. Under the general messing system the Government subsists the men entirely, and they have no more voice in the management of the commissary department than in any other department of the ship. The Government, through its authorized officer, provides them with the ration allowed by law. The food is purchased, cooked, and served entirely at the Government expense, and its value, whether it be more or less than 30 cents per diem per man, is a matter with which the men themselves have nothing to do.

10. In case any man considers that he is improperly subsisted he has the right, which all persons in the navy have, to state his grievance at the proper time and place to his commanding officer, who should then cause the commissary to investigate the matter, and, if the complaint is well founded, to take steps to place the responsibility and to prevent a recurrence of the fault complained of.

11. The men are entitled to the full benefit of the money and stores allowed for their subsistence, and no expenditure can be made from the general mess fund except for the benefit of the mess; nor can any of this money, or these stores, be withheld (when they can be used to advantage) and allowed to accumulate as a

surplus. In cases, however, where a surplus of either money or stores does unavoidably exist when a ship is placed out of commission, the members of the mess have no claim whatever to any part of it, and it reverts to the Government, the stores being taken up as a gain on issues and the money being credited to the appropriation "Provisions, Navy."

12. Subsistence of enlisted men absent from the ship on duty will, when practicable, be furnished by the general mess. When men are landed in large numbers for an expedition or for going into camp with the expectation of being absent from the ship for more than twenty-four hours, the commissary or the commissary steward, according to the proportion of the ship's company landed and the importance of the expedition, together with such cooks and bakers as may be necessary, and a sufficient number of messmen, should constitute the commissary corps.

The Commissary.—13. The pay officer of the ship, or, in ships having no pay officer, an officer designated by the captain, is the commissary, and is solely responsible for the purchase and preparation of the food for the general mess, the care of the stores, and the judicious expenditure of mess funds, keeping the accounts of the mess and administering all its affairs except the serving of the food at the mess table.

14. His authority in the performance of these duties is commensurate with his responsibility, and all persons employed in the service of the general mess are subject to his orders.

15. The commissary should frequently inspect the storerooms allotted to the general mess, and see that the stores are properly stowed and that the rooms are dry and well ventilated. Any deterioration in the stores being a direct loss to the mess, great care should be exercised in their selection, and no greater quantity should be bought at one time than can be used within the period they may be expected to keep in good condition.

16. The commissary should not permit any stores to be purchased until a list of them has been submitted to him and carefully examined and approved. No stores should be received on board unless accompanied by a bill or memorandum by which they can be checked off; and before being stowed away all stores should be carefully inspected by the commissary or the commissary steward. No bills should be contracted that cannot be paid from the funds in hand or by the ration money that will accrue to the mess during the current month. All bills should be settled at the end of each month, and always before the ship sails from port.

17. The commissary should keep the cash accounts of the mess so that they can be conveniently audited by the general inspector of the pay corps, the paymaster of the fleet, or by the board appointed for the purpose. All expenditures must be substantiated by vouchers, which are to be exhibited when the accounts are inspected.

18. He should cause the commissary steward to keep a stock account which should embrace all stores and all property of the general mess. The value of the balance shown upon this stock account should be taken into consideration in making up the statement of the financial condition of the mess.

19. The commissary should, when he deems it advisable, submit written reports and recommendations to the captain regarding the general mess, and he must do so whenever the interests of the mess require any change which he himself is not authorized to make.

20. The commissary should mark the enlisted men of his department in proficiency in rating and should immediately report any inefficiency or carelessness in their performance of duty.

21. He should frequently inspect the food before it is delivered to the messmen at the galley, and in case he finds it improperly prepared, should take steps to prevent any further occurrence of the kind. If cooks are not thoroughly competent, they should be made to follow strictly the recipes in this book, and flagrant cases of incompetency should be reported.

The Commissary Stewards.—22. The chief commissary steward or commissary steward is the chief petty officer in charge, under the commissary, of the general mess. He is entitled to respect and obedience from all persons of inferior rating while in the performance of his duties, and he is responsible for the proper execution of the orders of the commissary. The daily bill-of-fare should be made out by the commissary steward and submitted to the commissary, and the necessary

stores issued to the cooks at the galley. He should direct the manner of its preparation and shall be in charge of the galley and the men employed at it, and should frequently inspect the food before it is delivered to the messmen to be served. He should see that the galley and all the galley utensils are kept in proper condition, giving particular attention to their cleanliness.

23. He should report to the commissary daily, in writing, all purchases made and debts contracted, and keep that officer advised of the needs of the mess. He is to draw from the pay department, at the appointed times, such Government stores as are due the mess, and must keep an account of these stores for the verification of the provisions return at the end of each quarter. When fresh provisions are issued, he should be on deck, when practicable, to receive them from the representative of the pay department as soon as they have been received on board and inspected. In case these fresh provisions, or any other stores issued to the mess by the pay department, are, in the opinion of the commissary steward, of inferior quality and unfit for issue he should report the matter to the commissary, who shall make a personal investigation, and, in case he finds the objection well founded, should take the necessary steps to provide other stores, as prescribed by the regulations. An issuing book should be kept by the pay yeoman and signed daily by the commissary steward, in order that no question may arise at the end of the quarter as to the stores drawn by the general mess. The commissary steward may, with the authority of the commissary, draw from the pay department such Government stores as are required in excess of the allowance, and these stores shall be paid for from the mess fund at the end of each month.

The Cooks.—24. The senior cook, or, if there are two or more of the same rating, one selected by the commissary, should be in immediate charge of the galley and act in the capacity of head cook. He should be held strictly responsible for the cleanliness of the galley and the utensils pertaining to it, for the maintenance of discipline among his assistants, for the proper preparation of the food, and for having the meals ready at the prescribed hours. He should personally superintend the cooking of all meals, and should carefully inspect all food before it is delivered to the messmen. It is his duty to report to the commissary any inefficiency or neglect on the part of his assistants; otherwise the entire blame for poor cooking or any other delinquency at the galley should rest upon him. The head cook should keep the commissary steward informed as to the requirements of the galley, and should from time to time prepare lists of articles required by him in his cooking, which are not included in the navy ration. He is responsible for the galley utensils, and will report immediately when any are lost, worn out, or damaged.

25. The other cooks should, as far as possible, be assigned specific duties at the galley in order that the responsibility for any neglect may readily be placed. One should be detailed as "meat cook," another as "vegetable cook," and one man should, in addition to other duties, be held responsible for the preparation of the coffee and tea.

26. The cooks in the lower ratings should be detailed for starting fires, cleaning the galley and utensils (regular cleaning stations being assigned them), and for preparing the food for cooking.

27. The organization of the force at the galley should be as complete and efficient as that of a gun division.

The Bakers.—28. The commissary steward should issue to the baker such quantities of flour and other ingredients as may be necessary for making bread for the mess and keep him advised of the amount of bread required from day to day.

29. The baker, or, in ships which are allowed two bakers, the baker first class, is to be held responsible for the proper baking of the bread and for its delivery to the messmen at the appointed times. He is also responsible for the condition of the bake-ovens and the utensils used by him.

PART II.—THE COMMISSARY STORE

Establishment and Administration.—30. There being no public funds available for the establishment of a store on board ships of the navy, such establishment is not made compulsory, but is left to the discretion of the commanding

officer. The advantages of such a store are, however, so obvious and so great that provision is made in the regulations for its administration in ships where it exists or may be established.

31. The objects of a commissary store are:

(1) To enable the men to purchase a better quality of the articles usually obtained from bumboat men, and at a lower price.

(2) To return directly to the men all profits from their purchases not needed for carrying on the business.

(3) To bring under official control the sale of all merchandise on board ship, and thus do away with bumboat men and peddlers, and reduce the chances of liquor or other unauthorized articles being brought on board. The sale of any merchandise on board ship, except by the store, should be prohibited as far as practicable. Tailors, persons doing repairing, and those selling special articles which cannot conveniently be handled by the store, may be exempt from this prohibition, but dealers in milk, pies, fruit, and such articles should not be allowed to sell to the men.

32. The commissary should make agreement with reliable merchants to supply to the store, while the ship is in port, such stores as are salable but can not be carried in stock, and these articles should be delivered to the storekeeper and by him sold to the men at a very small advance. For example, if it be thought advisable to have milk for sale in the store when the ship is in port, the commissary should arrange with a dealer to place on board, at a specified time each day, a quantity of milk at a fixed price, such quantity as may be sold to be paid for, and the balance to be taken away by the dealer.

33. The stock being purchased from reliable firms at wholesale prices, will be better in quality and lower in price than that usually carried by bumboats or itinerant merchants. The greater part of the retail dealer's profit should revert directly to the purchaser at the time he buys the article—that is, the price charged should be very little, if any, above the wholesale price. Some profit must be made, however, and all that is not required for incidental expenses of the store must be turned over to the general mess fund, and thus it, also, reverts to the men in the form of delicacies for the mess table, such as are not a part of the navy ration.

34. In ships where the men desire to subscribe for the original stock of a commissary store, and the commanding officer authorizes its establishment, the commissary is, by the regulations, placed in charge of it. This officer is to receive voluntary subscriptions from the crew, giving them receipts (stated to be not negotiable) for the amount subscribed, with the agreement that these receipts may be surrendered and the amount of the subscription refunded *after* the original stock has been paid for and the business is on a good financial basis. The original subscribers, after they have been paid the amount of their subscriptions, have no further claim upon, nor interest in, the store.

35. During this period it is advisable to make the prices correspond with those of retail dealers in order that the store may be independent as soon as possible, but when all indebtedness has been discharged and the store is self-supporting, the profits should be reduced to a minimum, it being always borne in mind that making money is not one of the objects of the store. The injustice of making profits from sales to one set of men to be divided among another set at the expiration of a cruise is manifest, and for this reason the regulations provide that such profits be used to improve the bill-of-fare of the general mess, but with the present ample ration no addition to the mess fund should be necessary; and, by reduction in prices from time to time, as experience dictates, the monthly surplus should be reduced to a minimum, thus disposing of the regular retail dealer's profit in the most equitable manner possible, *i. e.*, by giving the benefit of it to each purchaser in the form of a discount.

36. It is impracticable to operate a store unless a suitable room, used for no other purpose and to which only the storekeeper has access, is available for the purpose.

37. No cash will be received at the store for articles purchased, but sales will be made under the following system:

Books of tickets of a form prescribed by the Bureau of Supplies and Accounts will be issued for cash by the pay officer and storekeeper and will be negotiable

at the store in lieu of money. The issue of these books by the pay officer will be made at the same time as the issue of monthly money, and by the storekeeper daily during the month as the men may desire to purchase them. For the latter issues the pay officer will turn over from time to time a limited number of books to the storekeeper, who will be held strictly accountable therefor, and will turn in to the pay officer daily the money received for same.

The Commissary.—38. The commissary of the ship has charge of the ship's store. He is allowed the services of a yeoman for duty as storekeeper. The commissary should give his personal attention to the purchase of stock for the store, should fix the prices at which the articles are sold, establish a business-like system for the operation of the store, and direct all its affairs. He should keep the cash account and cause the commissary steward to turn in daily all money not required for making change. He is to turn over to the general mess fund, monthly, so much of the surplus of the store as is not required for the purchase of new stock, and he should endeavor to so regulate the prices that this surplus will not be larger than necessary.

39. All the accounts of the commissary store should be kept in such manner as to admit of ready inspection by the general inspector of the pay corps, the paymaster of the fleet, or by the board appointed for that purpose.

The Storekeeper.—40. The storekeeper should be responsible to the commissary for the proper conduct of the store.

He is to keep the account of the stock, and of the sales, and submit to the commissary from time to time lists of articles required.

41. In order to protect the store from any loss, either through carelessness or dishonesty, the following method of keeping the accounts should be employed:

At the end of each month an account of stock should be taken by the commissary steward or the paymaster's yeoman, and the articles found to be on hand entered in a book similar to the return of clothing and small stores. (This blank may conveniently be used for the purpose, the headings of the columns being changed.) These quantities represent the stock on hand at the beginning of the new month and to them should be added all stores received from purchase. At the end of the month the quantities found to be on hand should be entered in the proper line and subtracted from the total receipts and the difference entered as "sales." By multiplying the number of each article sold by its selling price and taking the total of that line in the return will be found the amount which the storekeeper should have received, and this amount he should be required to turn in or account for.

42. If no prices are changed except at the beginning of the month, and if the established prices are displayed on the store bulletin board so that no overcharges can be made, this system will be a simple and absolute check on the storekeeper.

43. The man selected for this responsible duty should, first of all, be entirely trustworthy. He must be quick and accurate at figures and write legibly. It is his duty to receive such stock as may be delivered for the store, conveniently arrange it in the storeroom, and keep the latter clean and see that it is ready for inspection at the appointed times. He is to open the store for the sale of merchandise to the men at such times as may be appointed by the commissary, with the authority of the captain.

He should keep a small memorandum book in which to enter the amounts turned in daily to the commissary, and when that officer receives the money, he should initial the amount in the book.

PART III.—THE PREPARATION OF FOOD

The Ration.—44. The dietary of the enlisted men of the navy must necessarily be based upon the ration provided by law. In general messes, where the circumstances are favorable, provisions which are not a part of the ration may at times be purchased, but articles of which there is a supply already on board in the pay department should not be bought unless the Government stores shall have deteriorated, in which case they should be surveyed and a new stock obtained at the first opportunity.

45. Unless there should be some good reason for not doing so, the official issuing table should be strictly adhered to, it having been arranged to give the necessary variety.

The Galley.—46. The ship's galley (or that part of it used for the general mess), together with its appurtenances, is under the charge of the commissary. That officer should see that the galley and its utensils are properly cared for and are ready for inspection at the appointed times. He should himself frequently inspect this part of his department and advise the equipment officer of any repairs or alterations needed, and should, when occasion demands it, furnish that officer with a list of galley utensils requiring a survey.

Cooking.—47. On board ship, where the facilities are necessarily restricted and the food lacking in variety compared to that obtainable on shore, it is of the highest importance that the very best results possible under the circumstances should be obtained. With a liberal allowance of cooks and bakers, and a judicious selection of the men for these rates, the navy ration should be so prepared as to give the enlisted men three nourishing and palatable meals each day, and it should be the duty of the commissary department to see that this is done.

Frequent inspections of the food by the commissary and the commissary steward, and efficiency on the part of the cooks, alone can insure this.

DIETARIES IN PUBLIC INSTITUTIONS

The diet in public and in private or semiprivate institutions, which include armies, navies, hospitals, asylums, prisons, schools, colleges, and, in fact, any place where numbers of persons are fed under the direction of a steward, is a subject that requires close attention. During the past few years many dietary studies have been made, the greatest advantage following where the results of such studies have been applied. In the line of investigation much still remains to be done, however, for the public has not yet learned the importance of applying scientific methods to the supply and culinary departments of its institutions.

In applying modern methods to institutions a number of principles must be considered. These may best be understood from a careful review of Dunlop's Prison Dietaries, as given below, from which it will be seen that the amount of food necessary to nourish the body is taken as the starting-point. This amount is to be modified according to the condition of the individuals to be fed. Age, sex, occupation, environment, physical condition, and the like must all be taken into account. The evaporation and waste in food kept and used must be estimated and allowed for. The cost of the food is an important item. It must be borne in mind that it is often possible to supply a very acceptable meal at a moderate cost where more expensive articles of diet, while they might seem more desirable, would not answer the purpose so well. The food must be suited to the digestive powers of the consumers, and must be served in as attractive and digestible a form as possible. It must be remembered that while the number of calories required may be estimated, the food representing this amount must be supplied in such form that it can be utilized by the individual receiving it. Atwater's standards for the various classes, as given below under Prison Diet, are in general use in this country. A varying percentage is allowed for shrinkage and waste. This is usually placed at about 10 per cent. of the total energy. Mrs. Richards estimates 10 per cent. on the proteins and carbohydrates, and makes no allowance on the fats (in the standards given below). Very complete dietary studies have been made by Atwater in the hospitals for the insane in New York State. These studies are published in the reports of the New York State Commission in Lunacy for 1897–98, 1898–99, and 1899–1900. The pecuniary advantage alone of this study is apparent from the fact that there was a reduction of $2.19 per capita notwithstanding that the cost of food-products was higher

than usual. The patients are better fed, and the diet is such as is best suited to their condition and surroundings.

Atwater has suggested as a new profession that of dietary expert. This is a field for which women are perhaps particularly well adapted. The dietary expert is neither a cook nor an ordinary steward, but should be an individual who has had sufficient training along special lines to enable him to purchase food, formulate suitable and accurate diet-lists, supervise the keeping, cooking, and serving of food, so as to obtain the best results, reducing the amount of waste to a minimum, and securing as great a degree of perfection in the preparation of the food as it is possible to obtain.

Basic Quantity Food Tables.—Any one having to feed any number of individuals from two up in institutions should not be without the very excellent Basic Quantity Food tables to be used in determining the daily issue of food to the kitchen, prepared for the use of institutions by the Department of Public Charities of the City of New York, and issued July, 1917, and to be had from the Municipal Reference Library, 512 Municipal Building, New York City. The price is $1.25.

This book gives the tables for officers and staff, nurses, employees, inmates and patients, tuberculous patients, feeble-minded and epileptic children in hospitals, lodgers, and industrial workers at Municipal Lodging House. The tables show the daily per capita allowance and the amount that is to be sent to the kitchen for the varying number of individuals that have to be served.

PRISON DIETARIES

The subject of Prison Diet has received considerable attention, and the literature on the subject, although very large, is more or less inaccessible, being scattered, for the most part, throughout the reports of prisons and reformatories.

Numerous views have been expressed regarding what constitutes a proper diet for a prisoner. In England the standards recommended by the committee appointed by the Commissioners of Prisons in 1878 were followed for many years. The plan that was pursued was to divide the prisoners into four classes:

Class I.: Those confined for periods of seven days and less.

Class II.: Those confined for periods of more than seven days and not more than one month.

Class III.: Those confined for periods of more than one month and not more than four months.

Class IV.: Those confined for periods of more than four months.

This division was made in order to prevent those serving short sentences from receiving a full dietary. Since such prisoners are for the most part drunken and disorderly persons, it was held that

they might seek to be committed to prison for the sake of enjoying a short sentence with an abundant supply of food. Under the Prison Commission's plan all the prisoners began with the first dietary after seven days, and if they were still in prison, they were put on the second, and so on. This plan is not a good one, for it would seem better to place all long-term prisoners at once on a sufficient and appropriate diet.

Prison dietaries are now formulated according to the standards fixed for a healthy free man doing the same kind of labor. The following table, taken from Atwater,[1] gives these standards:

Proposed Dietary Standards for Adults.

(Quantities per man per day unless otherwise stated.)

Class.	By whom proposed.	Total protein.	Digestible or available protein.	Available energy or fuel-value.
		Gm.	*Gm.*	*Calories.*
Persons in health under ordinary conditions:				
Man [c] at hard muscular work	Atwater [d]	150	138	4350
Man [c] at moderately active muscular work	Atwater [d]	125	115	3400
Man [c] with light muscular work	Atwater [d]	112	102	3050
Man [c] with sedentary work	Atwater [d]	100	92	2700
Man [c] with very little exercise	Atwater [d]	90	72	2450
Inmates of prisons, insane hospitals, etc.:				
Male [c] convicts at hard work	Dunlop [e]	150	138	3800
Ordinary male prisoners	Dunlop [e]	120	110	3020
Prisoners and inmates of houses of correction, per person:	Richards[f]	103	95	2765
Inmates of reformatories (male)	Richards[f]	111	102	3000
Unemployed male [c] prisoners	Dunlop [e]	90	83	2385
Inmates of almshouses, per person . . .	Richards[f]	83	76	2435
Punitive diet, short duration	Dunlop [e]	64	59	1805
Punitive diet, long duration	Dunlop [e]	90	82	2385
The insane, per person	Richards[f]	110	101	3015
The insane, per person	Atwater [d]	85	78	2450

([a]) Assuming 92 per cent. digestible, the average in ordinary mixed diet.

([b]) These figures are about 3 per cent. smaller than have been given previously, the difference being due to the adoption of revised factors for calculations.

([c]) Corresponding values for a woman are 0.8 as much.

([d]) Figures represent physiologic demand.

([e]) Figures represent practically physiologic demand, there being but an extremely small allowance for waste.

([f]) Figures represent ration allowance, with margin for waste of about 10 per cent.

One of the most valuable studies of prison dietaries is that made by Dr. J. C. Dunlop for the Scottish Prison Commission, and published in 1899 as a "blue book." His standards are based on careful investigation, and upon actual experiment have been found to be

[1] Year-book of the Department of Agriculture, 1901.

satisfactory. They have been adopted in Scotland. His changes in the dietary previously furnished are based on the amount of labor, sex, age, and similar conditions.

Dunlop's Dietary Standards for Prisoners.

	Protein.	Fat.	Carbo-hydrates.	Energy value.
Ordinary male prisoners	120	38	550	3100
Ordinary female prisoners	96	30	440	2480
Ordinary female prisoners nursing	105	54	482	2910
Juveniles	75	43	325	2040
Male prisoners unemployed or practically so . .	90	30	440	2400
Female prisoners unemployed or practically so	72	23	330	1860
Male convicts at active labor	150	65	550	3500
Male convicts at less active labor	120	50	550	3200
Female convicts	100	41	440	2600
Punishment diets, short punishment (subsistence)	64	21	341	1850
Punishment diets, longer, with light work . . .	90	30	440	2400

NOTE.—Standards for criminal lunatics and sick prisoners, being unnecessary, are not included.

Dunlop's dietaries, since they represent complete classified lists made on a scientific basis and proved by experience, are here given in full. No hospital dietary is given, that being left entirely to the discretion of the medical officer.

DUNLOP'S PRISON DIETARIES IN USE IN SCOTTISH PRISONS.

RATE I.

All ordinary prisoners under sentence of imprisonment for not longer than three days.

Breakfast—Daily:		Gruel	1	pint.
		Bread	4	ounces.
Dinner—	Sunday:	Broth	1	pint.
		Bread	6	ounces.
	Monday:	Pea soup	1	pint.
		Bread	6	ounces.
	Tuesday:	Broth	1	pint.
		Bread	6	ounces.
	Wednesday:	Pea soup	1	pint.
		Bread	6	ounces.
	Thursday:	Broth	1	pint.
		Bread	6	ounces.
	Friday:	Milk	$\frac{3}{4}$	pint.
		Bread	8	ounces.
	Saturday:	Pea soup	1	pint.
		Bread	6	ounces.
Supper—	Daily:	Gruel	1	pint.
		Bread	4	ounces.

RATE II.

Male ordinary prisoners with sentences above three days, and not exceeding one calendar month.

Female and juvenile ordinary prisoners untried, or with sentences above three days and not exceeding six calendar months.

Breakfast—Daily:		Porridge	5	ounces, meal ration.
		Milk	$\frac{3}{4}$	pint.
Dinner—	Sunday:	Broth	$1\frac{1}{2}$	pints.
		Bread	6	ounces.
	Monday:	Pea soup	$1\frac{1}{2}$	pints.
		Bread	6	ounces.
	Tuesday:	Broth	$1\frac{1}{2}$	pints.
		Bread	6	ounces.
	Wednesday:	Pea soup	$1\frac{1}{2}$	pints.
		Bread	6	ounces.
	Thursday:	Broth	$1\frac{1}{2}$	pints.
		Bread	6	ounces.
	Friday:	Potato	$2\frac{1}{2}$	pounds.
		Milk	$\frac{3}{4}$	pint.
	Saturday:	Pea soup	$1\frac{1}{2}$	pints.
		Bread	6	ounces.
Supper—	Daily:	Porridge	5	ounces, meal ration.
		Milk	$\frac{1}{2}$	pint.

Rate III.

Male ordinary prisoners untried, or with sentences above one calendar month and not exceeding four calendar months.

Female and juvenile ordinary prisoners with sentences above six months.

Male ordinary prisoners employed all day at active labor in the open air; also those employed in workshops and laundries or nursing, with sentences from three days to one calendar month.

Female ordinary prisoners employed as nurses or in laundries with sentences from three days to six months.

Female convicts on probation.

Breakfast—Daily:		Porridge	8	ounces, meal ration.
		Milk	$\frac{3}{4}$	pint.
Dinner—	Sunday:	Broth	2	pints.
		Bread	8	ounces.
	Monday:	Pea soup	2	pints.
		Bread	8	ounces.
	Tuesday:	Broth	2	pints.
		Bread	8	ounces.
	Wednesday:	Pea soup	2	pints.
		Bread	8	ounces.
	Thursday:	Broth	2	pints.
		Bread	8	ounces.
	Friday:	Potato	$2\frac{1}{2}$	pounds.
		Milk	$\frac{3}{4}$	pint.
		Bread	4	ounces.
		(or fish dinner).		
	Saturday:	Pea soup	2	pints.
		Bread	8	ounces.
Supper—	Daily:	Porridge	5	ounces, meal ration.
		Milk	$\frac{1}{2}$	pint.

Rate IV.

Male ordinary prisoners with sentences above four months, and male convicts in probation and not on public works.

Breakfast—Daily:		Porridge	8	ounces, meal ration.
		Milk	$\frac{3}{4}$	pint.
Dinner—	Sunday:	Broth	2	pints.
		Bread	12	ounces.
	Monday:	Pea soup	2	pints.
		Bread	12	ounces.
	Tuesday:	Broth	2	pints.
		Bread	12	ounces.

	Wednesday:	Pea soup	2	pints.
		Bread	12	ounces.
	Thursday:	Broth	2	pints.
		Bread	12	ounces.
	Friday:	Potato	2½	pounds.
		Milk	¾	pint.
		Bread	8	ounces.
		(or fish dinner).		
	Saturday:	Pea soup	2	pints.
		Bread	12	ounces.
Supper—	Daily:	Porridge	6	ounces, meal ration.
		Milk	½	pint.

RATE V.

Female convicts not in the probation class.

Breakfast—	Sunday: Tuesday: Thursday: Saturday:	Tea	½	pint.
		Bread	8	ounces.
	Monday: Wednesday: Friday:	Tea	½	pint.
		Bread	8	ounces.
		Cheese	1	ounce.
Dinner—	Sunday:	Broth	1½	pints.
		Bread	8	ounces.
	Monday:	Beef	6	ounces.
		Potato	1	pound.
		Bread	6	ounces.
	Tuesday:	Beef	6	ounces.
		Bread	8	ounces.
	Wednesday:	Pea soup	1½	pints.
		Bread	8	ounces.
	Thursday:	Beef	6	ounces.
		Potato	1	pound.
		Bread	6	ounces.
	Friday:	Fish	12	ounces.
		Potato	1	pound.
		Bread	6	ounces.
	Saturday:	Beef	6	ounces.
		Bread	8	ounces.
Supper—	Daily:	Porridge	6	ounces, meal ration.
		Milk	½	pint.

RATE VI.

Male convicts not on probation and employed at indoor industrial labor.

Breakfast—	Daily:	Porridge	8	ounces, meal ration.
		Milk	¾	pint.
Dinner—	Sunday:	Pea soup	1½	pints.
		Bread	10	ounces.
		Cheese	1½	ounces.
	Monday:	Beef	6	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	4	ounces.
	Tuesday:	Beef	6	ounces.
		Broth	1	pint.
		Bread	6	ounces.
	Wednesday:	Beef	6	ounces.
		Broth	1	pint.
		Potato	1	pound.

		Bread	4	ounces.
	Thursday:	Beef	6	ounces.
		Rice soup	1	pint.
		Cabbage [1]	1	pound.
		Bread	4	ounces.
	Friday:	Beef	6	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	4	ounces.
	Saturday:	Beef	6	ounces.
		Broth	1	pint.
		Bread	6	ounces.
Supper—	Daily:	Coffee	¾	pint.
		Bread	12	ounces.

RATE VII.

Male convicts employed at hard labor at public works.

Breakfast—	Daily:	Porridge	8	ounces, meal ration.
		Milk	¾	pint.
Dinner—	Sunday:	Pea soup	1½	pints.
		Bread	12	ounces.
		Cheese	1½	ounces.
	Monday:	Beef	7	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	6	ounces.
	Tuesday:	Beef	7	ounces.
		Broth	1	pint.
		Bread	8	ounces.
	Wednesday:	Beef	7	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	6	ounces.
	Thursday:	Beef	7	ounces.
		Rice soup	1	pint.
		Cabbage [2]	1	pound.
		Bread	6	ounces.
	Friday:	Beef	7	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	6	ounces.
	Saturday:	Beef	7	ounces.
		Broth	1	pint.
		Bread	8	ounces.
Supper—	Daily:	Coffee	1	pint.
		Bread	12	ounces.

RATE VIII.

For male convicts at light labor.

Breakfast—	Daily:	Porridge	8	ounces, meal ration.
		Milk	¾	pint.
Dinner—	Sunday:	Pea soup	1½	pints.
		Bread	10	ounces.
		Cheese	1½	ounces.
	Monday:	Beef	4	ounces.

[1] An equal amount of carrot, turnip, turnip-tops, leeks, parsnips, or other fresh vegetables may be substituted.

[2] An equal amount of carrot, turnip, turnip-tops, leeks, parsnips, or other fresh vegetables may be substituted.

		Broth	1	pint.
		Potato	1	pound.
		Bread	4	ounces.
	Tuesday:	Beef	4	ounces.
		Broth	1	pint.
		Bread	6	ounces.
	Wednesday:	Beef	4	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	4	ounces.
	Thursday:	Beef	4	ounces.
		Rice soup	1	pint.
		Cabbage	1	pound.
		Bread	4	ounces.
	Friday:	Beef	4	ounces.
		Broth	1	pint.
		Potato	1	pound.
		Bread	4	ounces.
	Saturday:	Beef	4	ounces.
		Broth	1	pint.
		Bread	6	ounces.
Supper—	Daily:	Coffee	$\frac{3}{4}$	pint.
		Bread	12	ounces.

RATE IX.

(A) Prisoners under punishment for prison offences for terms not exceeding three days.

Breakfast—	Bread	8	ounces.
Dinner—	Bread	4	ounces.
Supper—	Bread	4	ounces.

(B) Prisoners under punishment for prison offences for terms exceeding three days.

Breakfast—	Gruel	1	pint.
	Bread	8	ounces.
Dinner—	Bread	8	ounces.
Supper—	Gruel	1	pint.
	Bread	8	ounces.

Criminal Lunatic Department.—Where the amount of ration is not stated that food is allowed *ad libitum.* This does not apply to butter, of which 8 ounces weekly are to be allowed for each inmate.

RATE X.

Breakfast—		Porridge	8	ounces, meal ration.[1]
		Sweet milk	$\frac{3}{8}$	pint.
		Skimmed milk	$\frac{3}{8}$	pint.
		Tea		
		Bread		
		Butter		
Dinner—	Sunday:[2]	Broth	$1\frac{1}{2}$	pints.
		Bread		
		Cheese	2	ounces.
	Monday:	Pea soup	1	pint.
		Beef	6	ounces.
		Potato		
		Bread		
	Tuesday:	Pork or mutton	6	ounces.
		Broth	1	pint.

[1] For female convicts 6 ounces, meal ration.

[2] The medical superintendent shall have power to alter the Sunday dinner.

		Potato[1]		
		Bread		
	Wednesday:	Beef	6	ounces.
		Potato		
		Pudding		
		Bread		
	Thursday:	Broth	1	pint.
		Beef	6	ounces.
		Potato[1]		
		Bread		
	Friday:	Fish	12	ounces.
		Potato		
		Bread		
		Pudding		
	Saturday:	Pea soup	1	pint.
		Beef	6	ounces.
		Potato		
		Bread		
Supper—	Daily:	Tea or coffee		
		Bread		
		Butter		

Food-value of Dunlop's Dietary Average per Diem.

	Protein.	Fat.	Carbo-hydrates.	Energy value, calories.
Rate I.	67.30	10.12	352.18	1810
Rate II.	91.82	25.52	362.55	2099
Rate II. with fat dinner	98.82	25.47	357.60	2114
Rate II. with sweet milk	106.03	54.37	453.46	2799
Rate II. with sweet milk and fish	113.33	54.03	448.51	2804
Rate III.	117.81	32.77	470.56	2715
With fish dinner	123.49	32.60	459.08	2690
Rate IV.	134.60	35.50	535.51	3115
With fish dinner	139.56	35.31	519.16	3067
Rate V.	120.63	42.53	402.13	2542
Rate VI.	153.93	50.62	536.08	3300
Rate VII.	165.44	56.54	566.00	3525
Rate VIII.	143.18	39.24	536.08	3149
Rate IX.	82.62	10.28	456.24	2313

"The following alternative and extra diets are to be allowed:

"1. Male prisoners of more than 168 pounds weight (partly clothed) receiving Rates IV., VI., VII., or VIII., and female prisoners of more than 154 pounds weight (partly clothed) receiving Rates III. or V., shall receive as an extra 1 ounce cheese and 4 ounces bread daily.

"2. Female prisoners nursing infants at the breast shall receive Rate III., with one pint sweet milk daily additional.

"3. Prisoners with sentences of more than one year may have after nine months in prison a supper consisting of ¾ pint of tea or coffee and 12 ounces bread daily instead of the porridge supper. This regulation does not apply to prisoners in Peterhead Convict Prison, nor to women with sentences of penal servitude in Perth Prison.

[1] Cabbage or other fresh vegetables may be substituted for potatoes.

"4. Prisoners receiving Rates III. and IV., with sentences of more than four months, may receive a fish dinner once weekly. The fish dinner shall consist of 12 ounces fresh fish, or 6 ounces dried fish, with 1 pound potatoes and 6 ounces bread with Rate III. diet, and 8 ounces with Rate IV. diet.

"5. When employed in the laundry, at the baths, and in the reception rooms, females may receive 1/4 pint tea between breakfast and dinner, and the same between dinner and supper.

"6. Male prisoners employed for two hours or more in the open air before breakfast shall receive 6 ounces bread and 1/2 pint milk before beginning work.

"7. The prison medical officers shall have power, should occasion arise, to increase or alter the diets of individual prisoners, and to reduce the diets of individual prisoners should they be satisfied that those prisoners are persistently wasting food."

The following directions relate to the foregoing dietaries, viz.;

"1. Each pint of soup must contain: (1) 1 ounce marrow bones or oxhead or 1/2 ounce hough, neck of beef, or other meat, and (2) be seasoned with pepper in a proportion not exceeding 1 ounce to 100 pints and with salt 1 pound to 100 pints. The first of these directions does not apply to soups served with the meat dinners of Rates VI., VII., and VIII.

"2. Each pint of broth shall contain 1 1/2 ounces of barley, 1/2 ounce of green peas, 1 1/2 ounces of leeks, carrots, turnips, or other similar vegetables, as may be most easily procured, and 1/4 ounce of onion.

"3. Each pint of pea soup shall contain 2 ounces of split peas, 1/4 ounce of pease meal, 1/4 ounce of onion or leeks, 1/2 ounce of carrots or turnips.

"4. Each pint of rice soup shall contain 2 ounces of rice and 1/4 ounce chopped parsley.

"5. Peas, barley, and rice to be well soaked before being used, and when served the peas ought to be perfectly soft.

"6. All vegetables to be cut and washed before being weighed.

"7. Potatoes should be cleaned, divided in half, and freed from bad ones before being weighed. Especial care must be taken to preserve the potatoes so that they shall not vegetate or be injured in any way.

"8. Gruel when made in quantities exceeding 50 pints shall contain 1 1/2 ounces of oatmeal per pint; when made in smaller quantity 2 ounces oatmeal per pint. Gruel to be seasoned with salt and sweetened with 3/4 ounce sugar per pint.

"9. Each pint of tea to be made from 1/4 ounce of tea, 1 ounce of sugar, and 1/2 gill of sweet milk.

"10. Each pint of coffee to be made from 1/2 ounce of ground coffee,

¾ ounce sugar, and ½ gill of sweet milk. Some chicory may be used with the coffee and weighed as such.

"11. Pudding (Rate IX.) to be either rice or bread crumb. Rice pudding to contain 1½ ounce rice, ½ ounce sugar, and $\frac{1}{10}$ pint sweet milk. Bread-crumb pudding, 2 ounces of bread crumb, ½ ounce of currants, 1½ ounce flour, 1 ounce suet, and 1 ounce sugar for each person.

"12. Meat to be weighed without bone and before being cooked.

"13. Fish to be weighed after being cleaned and trimmed, but before being cooked.

"14. The vessels in which the food is distributed may be collected half an hour after the prisoners have received them, except with dinner, when forty minutes must be allowed. All unconsumed remnants of food must be removed from the cells.

"15. In the event of the following articles of diet not being readily obtainable or excessive in price, the undernamed substitute may be used:

"*Buttermilk.*—Substitute skimmed or separated milk in equal quantity, or failing these, 2 ounces of cheese for each milk ration and 1 ounce sugar should that milk ration be due for a porridge meal.

"*Potato.*—Substitute 2 ounces rice and 8 ounces fresh vegetable for 1 pound potato, or failing fresh vegetable, 4 ounces rice.

"*Cabbage or Other Vegetable* (Rates VI., VII., and VIII.).—Substitute 4 ounces bread for 1 pound cabbage or other vegetable."

American Prison Dietaries.—There is no dietary that can specifically be called American. In the best ordered prisons the dietaries are based on Atwater's standards. In many States the diet is left to the steward of the prison, and no particular method is followed. Details will be found in the reports of the various institutions and also in the reports of conventions of charities and corrections.

English Prison Dietaries.—The Committee of 1899 condemns the utilization of diet as a means of punishment, but recommends what amounts to the same, *i. e.*, that the diet of prisoners who are sentenced for a term of less than three weeks be smaller than that of those who are sentenced for three months or longer. For short-term prisoners they recommend that the diet be "adequate in amount and kind to maintain health and strength during the single week," but it is not to be made attractive to the "loafer" or mendicant. The progressive system formerly in use is now condemned. The diet is to be adequate to nourish the body and maintain strength, so that at the end of his term the prisoner may be in condition to return to his occupation. For fourteen-day sentences, however, the prisoner is kept the first seven days on a spare diet, and for the remaining seven receives a somewhat fuller diet.

The Committee recognizes that the nature of the work the prisoner is doing should be considered, but does not attempt to make any

dietaries for local prisons along these lines; since, therefore, the diet intended for prisoners at ordinary labor is barely sufficient, the prisoner at hard labor would, on the same diet, be underfed. The diet thus becomes a mode of punishment again, a practice that is to be condemned.

The same Report advises a different diet for men, women, and children. Dunlop gives the following résumé of the English prison dietaries.

Ordinary Prisoners' Dietaries.—The dietaries recommended in the report for ordinary prisoners are no fewer than nine; three classes, A, B, and C, each class with three dietaries—No. 1 for men, No. 2 for women, and No. 3 for juveniles.

"*Class A Dietaries.*—For prisoners with sentences of not more than seven days, and for prisoners with sentences of not more than fourteen days during the first seven days of their imprisonment. These dietaries are described in the Committee's report as 'of the plainest food, unattractive, but good and wholesome and adequate in amount and kind to maintain health and strength during the single week.' They consist of bread and gruel for breakfast and supper, and bread with either potato or porridge or suet pudding for dinner. An allowance of milk is given as an extra to juveniles. The daily food-value is estimated by the Committee as consisting of—For men, protein 3.88 ounces (109 grams); carbohydrate, 17.08 ounces (484.22 grams); fats, 0.89 ounces (25.23 grams); for women, protein, 2.71 ounces (79.38 grams); carbohydrate, 13.71 ounces (391.22 grams); fats, 0.74 ounces (20.97 grams); for juveniles, protein, 3.93 ounces (111.40 grams); carbohydrate, 14.67 ounces (415.87 grams); fats, 1.48 ounces (41.94 grams). The energy value of such diets is found by calculation to be as follows: For men, 2667 calories; for women, 2124 calories; and for juveniles, 2552 calories. A comparison with the standards of prisoners' food requirements (*vide* p. 14 of this report) shows that the diet for men is insufficient except when the men are almost idle, that the diet for women is also insufficient except when the women are idle, but that the diet for juveniles is sufficient.[1] From the fact that Class A Diets are insufficient for working men and women, it follows that these introduce a distinct penal element into the dietary regulation. It may be urged that slight underfeeding for a limited time does no serious harm. That may be so, but an insufficient diet is essentially a penal diet; shortening the application cannot make an insufficient diet a sufficient one, and therefore an insufficient diet for even a short application is a penal diet.

"*Class B Diets.*—(1) For prisoners with sentences of more than seven days and less than fourteen days after the expiry of seven days

[1] "The Committee compare their dietaries with König's standard for moderate work. His male standard contains practically the same amount of protein as the standard I. gives for moderate work, but has more fat and less carbohydrate than mine. The energy value is practically the same."

of their sentence; (2) for prisoners with sentences of more than fourteen days and not more than three months; (3) for untried prisoners, offenders of the first division who do not maintain themselves, offenders of the second division, and debtors (untried prisoners and offenders of the first division receive tea or cocoa instead of gruel or porridge for breakfast and supper). These diets consist of bread and gruel for breakfast, bread and potato with either tinned meat or beans and bacon, or soup, or suet pudding, or cooked beef for dinner, and bread with either porridge, gruel, or cocoa for supper. Juveniles are allowed a small quantity of milk for breakfast. The food-value of these diets as calculated by the Committee is—for men, protein, 4.73 ounces (133.8 grams); carbohydrate, 18.32 ounces (519.34 grams); fats, 1.38 ounces (39.12 grams); for women, protein, 3.94 ounces (116.68 grams); carbohydrate, 11.87 ounces (434.59 grams); fats, 1.06 ounces (30.05 grams); for juveniles, protein, 4.30 ounces (121.89 grams); carbohydrate, 19.15 ounces (439.13 grams); and fats, 1.85 ounces (50.74 grams). The energy values of these diets calculated from these figures are—for men, 3098 calories; for women, 2519 calories; and for juveniles, 2772 calories. A comparison shows that these three dietaries closely approximate to the standards for men, women, and juveniles doing a moderate day's work.

"*Class C Diets.*—For all ordinary prisoners with sentences of more than three months. These diets closely resemble those of Class B. They differ by having large allowances of some of the dinner dishes, as potatoes, beans, and suet pudding, and by cocoa being substituted for porridge or gruel at supper time, and in the female diet by tea being given instead of gruel at breakfast time. The Committee estimate the daily food-value of these diets as follows: That for men, protein, 4.90 ounces (138.9 grams); carbohydrate, 19.15 ounces (542.87 grams); fat, 1.85 ounces (52.44 grams); for women, protein, 3.92 ounces (111.11 grams); carbohydrate, 14.89 ounces (422.12 grams); fats, 1.61 ounces (45.63 grams); for juveniles, protein, 4.59 ounces (130.11 grams); carbohydrate, 16.40 ounces (464.94 grams); and fat, 2.05 ounces (58.10 grams). From these figures the energy value of the diets appear to be—for men, 3283 calories; for women, 2611 calories; and for juveniles, 2980 calories. These three dietaries may all be described as being in excess of the requirements of the standards for moderate work."

French Prison Dietaries.—The French use the canteen system. Prisoners having private means and working prisoners may purchase from the canteen certain food-supplies to augment the ordinary prison diet. This method has to recommend it the fact that it tends to make the idle prisoner work harder, but it has the disadvantage that it discriminates between the poor and the well-to-do prisoner.

The French prisoner receives daily about 1½ pounds of bread. He is given two meals a day—soup at 9 A. M. and a dish of vegetables at

6 P. M. Meat is served on fête days and on Sundays, and to long-sentence prisoners on Thursdays. This dietary, without the extras, is not sufficient for a working-man. By the purchase of the supplies allowed it may be rendered ample. From the canteen the prisoner may purchase daily 1½ pounds of bread and a portion of one of the following: potatoes, cheese, butter, milk, salad, fruit, and beef. The daily value must not exceed 20 centimes for bread and 15 centimes for the other articles. The French use especial diets for the criminal insane, for the sick in hospitals, and for nursing mothers.

Prussian Prison Dietaries.—These are somewhat similar to the French. Three meals are allowed daily. Meat is used sparingly, and the bulk of the diet consists of cereals and vegetables. No classification is made, so far as is known, except for nursing mothers, for those serving sentences of less than four days, and for prison offences.

HOSPITAL DIETARIES

There is a wide variation in the diet-lists of the various hospitals, dependent on the size, income, management, etc., of the institute. These diet-lists are designated by various names, according to the persons for whom they are intended and the articles of which they are made up.

In children's hospitals the food for each infant should be prescribed individually. For convenience those over one year and under two or two and one-half years may be put on a suitable diet designated as "baby diet." For older children the designations for diets are the same as in hospitals for adults.

The diets in use in the average American hospitals are classified as follows:

Ward Diet.—This is also known as "full" or "house diet." It is the ordinary diet of all patients for whom special diet orders have not been given. (By reference to the hospital diet-lists given below the composition of the various diets can be learned.)

Light diet, also known as convalescent diet, is that used for convalescent patients generally and for others for whom it is suitable. It consists of milk, broths, eggs, and such other foods as are easily digestible yet nutritious.

Special Diets.—Under this heading are included dietary formulas suitable for those diseases in which diet plays an important part in the treatment. It includes such diets as have been recommended in certain diseases, and which bear the name of the inventor, as Tufnell's diet for aneurysm, Banting's diet for obesity, and such general diets as the following:

Milk Diet.—This is composed entirely of milk, two to three quarts usually being allowed daily.

Meat Diet.—This consists chiefly of nitrogenous animal foods with

a minimum of sugars and starches. It is useful in certain diseases of the stomach where there is acid fermentation. It closely resembles the diabetic diet.

Farinaceous Diet.—This is made up of milk, butter, and carbohydrates. It is prescribed for convalescents and in chronic nephritis, etc.

Special or extra special articles of diet, as they are often termed, include all articles not on the regular diet-list for the day, and for which special orders are generally given.

It is a fact much to be deplored that the commissary department of many large hospitals is poorly managed. In some, special hospital stewards of experience are appointed, but in many the ordering and the preparation of the meals, and often, indeed, the distribution of the food to the patients, are assigned to inexperienced persons who are frequently ignorant of the requirements of the patients. As a result, errors in diet, with their consequences, are common, and very often there is waste as well. In a large hospital a competent steward is a necessity and an economy as well.

The physician should prescribe the diet for each patient. It is a fact that in many hospitals where the catering is not deficient, the diet for patients is selected by the nurses, with the exception, perhaps, in the case of a few of the more important diseases, such as typhoid, diabetes, and the like. The conclusion to be drawn is obvious.

THE JOHNS HOPKINS HOSPITAL DIET SHEET

Breakfast, 8 A.M.: Fruit, cereal (oatmeal, hominy, grits, Wheatena), chops, steak, chicken (broiled), bacon, fish, potatoes, rolls.

Dinner, 1 P.M.: Soup, fish, beef (roast), lamb (roast), mint sauce, chicken (roast), turkey (roast), cranberry sauce, sweetbreads, salads (cress, lettuce), tomatoes, celery, potatoes, rice, vegetables, dessert, fruit.

Tea, 6 P.M.: Chicken, chops, steak, fish, potatoes, rolls, fruit.

The Johns Hopkins Hospital Daily Order for Ward

Milk, quarts or gallons	Mutton-broth, pints ....
Eggs, dozen	Chicken-soup, pints ....
Butter, pounds	Beefsteak ....
Sugar, pounds	Chickens ....
Beef-tea, pints	Lemons, dozen ....

Number of patients on

Ward diet ....
Special diet ....
Light diet ....
Liquid diet ....

Total ....

............................*Head Nurse.*

Weekly Order.

Special Orders for Monday, A. M.:

Tea ....
Coffee ....

Cocoa ....
Chocolate ....

DIET OF THE LAKESIDE HOSPITAL, CLEVELAND, OHIO

Doctors

Breakfast: Fruit, wheat gem and cream, baked beans, eggs, fish-balls, brown bread, toast, coffee, milk.
Luncheon: Scalloped oysters, potato, cold meat, fruit salad, cake, tea, milk.
Dinner: Roast-beef, Yorkshire pudding, potato, squash, celery, lettuce, Charlotte Russe, crackers and cheese, coffee, milk.
Breakfast: Fruit, oatmeal and cream, broiled chops, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, cream chipped beef, baked potato, cold meat, fried mush and maple syrup, tea, milk.
Dinner: Soup, broiled steak, Maitre d' Hotel sauce, potato, asparagus-tips on toast, olives, lettuce, mock cherry pie, crackers and cheese, coffee, milk.
Breakfast: Fruit, oatmeal and cream, broiled fish, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, mutton cutlets, brown sauce, potato, fruit-jelly, whipped cream, tea, milk.
Dinner: Soup, roast duck, jelly, potato, stewed tomatoes, olives, lettuce, strawberry ice-cream, crackers and cheese, cake, coffee, milk.
Breakfast: Fruit, oatmeal and cream, broiled chops, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, egg vermicelli on toast, potato, cold meat, boiled rice with cream and maple syrup, tea, milk.
Dinner: Soup, roast lamb, mint sauce, jelly, potato, string-beans, lettuce, chocolate pudding, custard sauce, crackers and cheese, coffee, milk.
Breakfast: Fruit, oatmeal and cream, broiled steak, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, cod à la mode, potato, cold meat, apple sauce, hot muffins, cocoa and whipped cream, tea, milk
Dinner: Soup, roast turkey, cranberry sauce, potato, mashed turnip, celery, lettuce, "snow-balls," cream sauce, crackers and cheese, coffee, milk.
Breakfast: Fruit, oatmeal and cream, scrambled eggs and bacon, potato, rolls, toast, coffee, milk.
Luncheon: Clam chowder, potato, cold meat, doughnuts and cheese, tea, milk.
Dinner: Soup, roast-beef, potato, Italian spaghetti, olives, lettuce, bisque ice-cream, crackers and cheese, cake, coffee, milk.
Breakfast: Oatmeal and cream, Hamburger steak, mushroom sauce, eggs on toast, potato, rolls, toast, coffee, milk.
Luncheon: Soup, Finnan haddock, potato, cold meat, hot biscuits, honey, tea, milk.
Dinner: Soup, chicken à la Maryland, potato, green peas, celery, lettuce, French fruit pudding, sauce, crackers and cheese, coffee, milk.
Breakfast: Fruit, wheat gem and cream, baked beans, eggs, fish-balls, brown bread, toast, coffee, milk.
Luncheon: Oyster stew, lobster salad, potato, cold meat, fruit-jelly, cake, tea, milk.
Dinner: Soup, roast-beef, potato, squash, olives, lettuce, Sultana ice-cream, crackers and cheese, cake, coffee, milk.
Breakfast: Fruit, oatmeal and cream, broiled chops, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, hash, cold meat, baked apples, cake, tea, milk.
Dinner: Soup, roast lamb, mint sauce, jelly, potato, spinach, lettuce, tapioca cream, crackers and cheese, coffee, milk.
Breakfast: Fruit, oatmeal and cream, broiled ham and eggs, potato, rolls, toast, coffee, milk.

Luncheon: Soup, Frankfurter sausage, hot slaw, potato, cold meat, banana fritters and maple syrup, tea, milk.
Dinner: Soup, broiled chicken, potato, scalloped corn, celery, lettuce, caramel ice-cream, crackers and cheese, cake, coffee, milk.
Breakfast: Fruit, oatmeal and cream, broiled steak, eggs, potato, rolls, toast, coffee, milk.
Luncheon: Soup, fried scallops, tartar sauce, potato, cold meat, ginger-bread and cheese, tea, milk.
Dinner: Soup, roast-beef, potato, stewed tomato, olives, lettuce, apple pie, crackers and cheese, coffee, milk.

Nurses

Breakfast: Oatmeal and cream, broiled ham, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold meat, horseradish sauce, potato, banana fritters and maple syrup, tea, milk.
Dinner: Soup, braised beef, potato, hot slaw, caramel ice-cream, cake, coffee.
Breakfast: Oatmeal and cream, creamed fresh fish, potato, rolls, toast, coffee, cocoa.
Luncheon: Beef-stew with dumplings, ginger-bread and cheese, tea, milk.
Dinner: Soup, roast-beef, potato, stewed tomato, apple pie and cheese, coffee.
Breakfast: Wheat gems and cream, baked beans, fish-balls, brown bread, toast, coffee, cocoa.
Luncheon: Scalloped oysters, potato, prune jelly, tea, milk.
Dinner: Soup, roast-beef, potato, squash, steamed molasses pudding, nutmeg sauce, coffee.
Breakfast: Oatmeal and cream, creamed fresh fish, potato, rolls, toast, coffee, cocoa.
Luncheon: Creamed chipped beef, potato, fried mush and maple syrup, tea, milk.
Dinner: Soup, New England boiled dinner, apple pie and cheese, coffee.
Breakfast: Oatmeal and cream, broiled steak, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold corned beef, horseradish sauce, potato, dates, tea, milk.
Dinner: Soup, beef à la mode, potato, stewed tomato, strawberry ice-cream, cake, coffee.
Breakfast: Oatmeal and cream, liver and bacon, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold meat in brown sauce, potato, boiled rice with cream or maple syrup, tea, milk.
Dinner: Soup, roast lamb, mint sauce, potato, string-beans, chocolate pudding, coffee.
Breakfast: Oatmeal and cream, broiled steak, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold lamb, pickles, potato, apple sauce, hot muffins, tea, milk.
Dinner: Soup, beef pie, potato, mashed turnips, rice pudding, coffee.
Breakfast: Oatmeal and cream, scrambled eggs and bacon, potato, rolls, toast, coffee, cocoa.
Luncheon: Clam chowder, ginger-bread and cheese, tea, milk.
Dinner: Soup, Finnan haddock, potato, macaroni and cheese, beet pickles, bisque ice-cream, cake, coffee.
Breakfast: Oatmeal and cream, Hamburger steak, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold meat in tomato sauce, potato, bananas, tea, milk.
Dinner: Soup, roast-beef, apple sauce, potato, green peas, New England pudding, coffee.
Breakfast: Wheat gem and cream, baked beans, fish-balls, brown bread, toast, coffee, cocoa.
Luncheon: Oyster stew, cold meat, fruit-jelly, tea, milk.
Dinner: Soup, roast-beef, potato, squash, steamed date pudding, lemon sauce, coffee.
Breakfast: Oatmeal and cream, broiled fish, potato, rolls, toast, coffee, cocoa.
Luncheon: Cold meat, potato, baked apples, tea, milk.
Dinner: Soup, roast lamb, mint sauce, potato, boiled beets, tapioca cream, coffee.

Servants' Dining Room.

Breakfast: Oatmeal and milk, broiled ham, potato, rolls, coffee, tea.
Dinner: Braised beef, potato, hot slaw, baked date pudding.
Supper: Cold meat, peach sauce, tea.
Breakfast: Oatmeal and milk, creamed fresh fish, potato, rolls, coffee, tea.
Dinner: Soup, beef-stew with dumplings, potato, stewed tomato, caramel ice-cream.
Supper: Cold meat, apple sauce, tea.
Breakfast: Wheat gems and milk, baked beans, fish-balls, brown bread, coffee, tea.
Dinner: Roast-beef, potato, squash, steamed molasses pudding.
Supper: Cold meat, apple sauce, tea.
Breakfast: Oatmeal and milk, creamed fresh fish, potato, rolls, coffee, tea.
Dinner: Soup, New England boiled dinner, date pudding.
Supper: Cold meat, prune sauce, tea.
Breakfast: Oatmeal and milk, broiled steak, potato, rolls, coffee, tea.
Dinner: Beef à la mode, potato, stewed tomato, dates.
Supper: Cold meat, peach sauce, tea.
Breakfast: Oatmeal and milk, liver and bacon, potato, rolls, coffee, tea.
Dinner: Soup, roast lamb, potato, boiled onions, strawberry ice-cream.
Cold meat, apple sauce, tea.
Breakfast: Oatmeal and milk, creamed chipped beef, potato, rolls, coffee, tea.
Dinner: Beef pie, potato, mashed turnips, bread pudding.
Supper: Cold meat, apple sauce, tea.
Breakfast: Oatmeal and milk, creamed salt fish, potato, rolls, coffee, tea.
Dinner: Soup, clam chowder, potato, baked macaroni, apple brown betty.
Supper: Cold meat, prune sauce, tea.
Breakfast: Oatmeal and milk, Hamburger steak, potato, rolls, coffee, tea.
Dinner: Soup, New England boiled dinner, bread pudding.
Supper: Cold meat, hot biscuits, peach sauce, tea.
Breakfast: Wheat gems and milk, baked beans, fish-balls, brown bread, coffee, tea.
Dinner: Roast-beef, potato, squash, steamed date pudding, lemon sauce.
Supper: Cold meat, apple sauce.
Breakfast: Oatmeal and milk, broiled fish, potato, rolls, coffee, tea.
Dinner: Soup, roast lamb, potato, boiled onions, New England pudding.
Supper: Cold meat, tea.

House Diet

Breakfast: Oatmeal and milk, creamed fish, potato, coffee, tea.
Dinner: Soup, lamb-stew, potato, creamed cabbage, baked date pudding, tea.
Supper: Malt breakfast food, peach sauce, tea, cocoa.
Breakfast: Oatmeal and milk, hash, coffee, tea.
Dinner: Soup, roast-beef, potato, stewed tomato, caramel ice-cream.
Supper: Corn-starch, blanc-mange, apple sauce, tea, cocoa.
Breakfast: Wheat gem and milk, baked beans, brown bread, coffee, tea.
Dinner: Soup, roast-beef, potato, squash, prune jelly, tea.
Supper: Corn-starch, blanc-mange, apple sauce, tea, cocoa.
Breakfast: Oatmeal and milk, scrambled eggs, potato, coffee, tea.
Dinner: Soup, roast-beef, potato, boiled carrots, date pudding, tea.
Supper: Hominy, prune sauce, tea, cocoa.
Breakfast: Oatmeal and milk, creamed fresh fish, potato, coffee, tea.
Dinner: Soup, lamb-stew, potato, stewed tomato, dates, tea.
Supper: Farina, peach sauce, tea, cocoa.
Breakfast: Oatmeal and milk, hash, coffee, tea.
Dinner: Soup, roast lamb, potato, boiled onions, strawberry ice-cream, tea.
Supper: Cerealine, apple sauce, tea, cocoa.
Breakfast: Oatmeal and milk, broiled minced beef, potato, coffee, tea.
Dinner: Soup, roast-beef, potato, mashed turnip, bread pudding, tea.
Supper: Malt breakfast food, sauce, tea, cocoa.
Breakfast: Oatmeal and milk, creamed salt fish, potato, coffee, tea.
Dinner: Soup, baked fish, potato, baked macaroni, apple brown betty.
Supper: Irish moss, blanc-mange, prune sauce, tea, cocoa.

Breakfast: Oatmeal and milk, hash, coffee, tea.
Dinner: Soup, roast-beef, potato, boiled beets, vanilla ice-cream, tea.
Supper: Hominy, peach sauce, tea, cocoa.
Breakfast: Wheat gem and milk, baked beans, brown bread, coffee, tea.
Dinner: Soup, roast-beef, potato, squash, prune jelly, tea.
Supper: Farina, apple sauce, tea, cocoa.
Breakfast: Oatmeal and milk, scrambled eggs, potato, coffee, tea.
Dinner: Soup, roast lamb, potato, boiled onions, New England pudding, tea.
Supper: Cerealine, prune sauce, tea, cocoa.

FULL DIET-TABLE—NAVY HOSPITALS

The following diet will be observed for patients in hospital when practicable, proper restrictions being ordered, or a special diet prescribed, by the medical officer in charge of the ward, in any case requiring it:

SUNDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 6 ounces; sugar, 1 ounce; oatmeal, 1 ounce; beefsteak, 6 ounces.

Dinner: Rice soup, 8 ounces; bread, 4 ounces; roast-beef or roast or boiled fowl, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; bread pudding with sauce or frozen custard, 8 ounces; fresh fruit, 6 ounces.

Supper: Tea, $\frac{1}{4}$ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; cold roast mutton or cold roast-beef, 4 ounces; stewed dried fruit or baked fresh fruit or apple sauce, 4 ounces.

MONDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 2 ounces; sugar, $\frac{3}{4}$ of an ounce; cornmeal (bread or mush), $2\frac{1}{2}$ ounces; ham and eggs (2) or potatoes, 4 ounces; sausage, 3 ounces.

Dinner: Sago soup, 8 ounces; bread, 4 ounces; roast mutton or lamb or boiled ham, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; pie, 6 ounces.

Supper: Tea, $\frac{1}{4}$ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; cold roast-beef or beef-stew or hash, 8 ounces; cheese, 2 ounces; baked fresh fruit or apple sauce or stewed dried fruit, 4 ounces.

TUESDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 2 ounces; sugar, $\frac{3}{4}$ of an ounce; pork, 1 ounce, and beans, 4 ounces, or beef-stew or hash, 8 ounces, or mutton-stew, 8 ounces.

Dinner: Vegetable soup, 8 ounces; bread, 4 ounces; boiled corned beef or roast-beef, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; boiled or baked dumplings with sauce, 6 ounces.

Supper: Tea, $\frac{1}{4}$ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; cold roast mutton or lamb or cold ham, 4 ounces; apple sauce or baked fresh fruit or stewed dried fruit, 4 ounces.

WEDNESDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 6 ounces; sugar, 1 ounce; oatmeal, 1 ounce; mutton or lamb chops, 6 ounces, or liver, 4 ounces, and bacon, $\frac{1}{2}$ an ounce.

Dinner: Macaroni soup, 8 ounces; bread, 4 ounces; roast veal or roast or boiled fowl, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; tapioca pudding with sauce, 6 ounces.

Supper: Tea, $\frac{1}{4}$ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; corned-beef hash, 8 ounces, or cold roast-beef, 4 ounces; stewed dried fruit or baked fresh fruit or apple sauce, 4 ounces.

THURSDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 2 ounces; sugar, $\frac{3}{4}$ of an ounce; beefsteak, 6 ounces; sugar, $\frac{1}{4}$ of an ounce; milk, 4 ounces; oatmeal, 1 ounce, or potatoes, 4 ounces.

Dinner: Vermicelli soup, 8 ounces; bread, 4 ounces; roast-beef, 8 ounces, and potatoes, 8 ounces, or pork, 3 ounces, and beans, 4 ounces; other vegetables, 6 ounces; pickles, 1 ounce; cornstarch pudding with sauce, 6 ounces.

Supper: Tea, $\frac{1}{4}$ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; cold veal-stew or beef-stew or hash, 8 ounces; baked fresh fruit or stewed dried fruit or apple sauce, 4 ounces.

FRIDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 2 ounces; sugar, $\frac{3}{4}$ of an ounce; sugar, milk, 4 ounces; oatmeal, 1 ounce; mackerel, 4 ounces, or hominy, 2 ounces; codfish, 4 ounces.

Dinner: Bean soup, 8 ounces; bread, 4 ounces; fish, fresh, 10 ounces, or fish, salt, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; pie, 6 ounces.

Supper: Tea, $\frac{1}{4}$ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; macaroni, 2 ounces, and cheese, 1 ounce, or cold roast-beef, 4 ounces, or beef-stew or hash, 8 ounces. Stewed dried fruit or apple sauce or baked fresh fruit, 4 ounces.

SATURDAY:

Breakfast: Coffee, 1 ounce; bread, 4 ounces; butter, 1 ounce; milk, 2 ounces; sugar, $\frac{3}{4}$ of an ounce; beef-stew or mutton stew, 8 ounces.

Dinner: Barley soup, 8 ounces; bread, 4 ounces; roast-mutton or roast-beef, 8 ounces; potatoes, 8 ounces; other vegetables, 6 ounces; pickles, 1 ounce; rice pudding with sauce, 6 ounces.

Supper: Tea, $\frac{1}{4}$ of an ounce; bread, 6 ounces; butter, 1 ounce; milk, 2 ounces; sugar, 1 ounce; dried chipped beef, 3 ounces, or canned salmon, 4 ounces; apple sauce or stewed dried fruit or baked fresh fruit, 4 ounces.

The weights of meats and vegetables, including cereals, etc., are those of the articles as purchased, and this applies to the table as a whole, the exceptions, such as soups and puddings, being apparent. Whenever stews are indicated, 4 ounces of meat and an equal amount of potatoes are allowed in their composition, with such simple additions as palatableness may require. For supper the cold meats prescribed may be made into hashes or stews when it is considered advisable for the sake of variety.

The item ''bread'' is considered to include loaf, rolls, and other forms, and a reasonable variety of the best quality should be provided. Syrup or honey, not to exceed 1 ounce, should be allowed at breakfast as desired. It is assumed that the table is provided at all times with vinegar, salt, and the usual condiments.

From time to time, as the season permits, fruits and berries may be substituted for the desserts prescribed, and under the head of ''other

vegetables" provision for additional fresh food should be made as the abundance of the market permits.

The foregoing table shall be observed for employees.

I. ORDINARY DIET TABLE—UNITED STATES MARINE HOSPITALS

SUNDAY:

Breakfast: Chocolate, 1 pint; bread, 6 ounces; butter, ½ of an ounce; meat-stew, 4 ounces; fruit sauce, 3 ounces.

Dinner: Soup, 1 pint; roast-beef, 6 ounces; potatoes, 8 ounces; other vegetables, 4 ounces; rice or tapioca pudding, 4 ounces.

Supper: Tea, 1 pint; bread, 6 ounces; butter, ¾ of an ounce; mush and milk, 12 ounces.

MONDAY:

Breakfast: Coffee, 1 pint; bread, 6 ounces; butter, ½ of an ounce; meat-hash with vegetables, 6 ounces; stewed fruit, 3 ounces.

Dinner: Vegetable soup, 1 pint; beef (boiled), 6 ounces; potatoes, 8 ounces; pudding with sauce, 4 ounces; bread, 4 ounces.

Supper: Tea, 1 pint; bread, 6 ounces; butter, ½ of an ounce; fruit sauce, 3 ounces.

TUESDAY:

Breakfast: Coffee, 1 pint; bread, 6 ounces; butter, ½ of an ounce; corned-beef hash with potatoes, 6 ounces.

Dinner: Beef soup, 1 pint; beef (boiled), 6 ounces; fish, fresh, 6 ounces; vegetables, 8 ounces; bread, 4 ounces; fruit, 4 ounces.

Supper: Tea, 1 pint; bread, 6 ounces; butter, ½ of an ounce, fruit (stewed), 4 ounces. Fresh fruit may be substituted in season.

WEDNESDAY:

Breakfast: Coffee, 1 pint; bread, 4 ounces; butter, 2 ounces; fish-hash with vegetables, 6 ounces.

Dinner: Mutton broth, 1 pint; mutton (boiled), 6 ounces; potatoes, 8 ounces; rice pudding with sauce, 4 ounces; bread, 4 ounces.

Supper: Tea, 1 pint; bread, 6 ounces; butter, ½ of an ounce; cooked fruit, 4 ounces.

THURSDAY:

Breakfast: Coffee, 1 pint; bread, 6 ounces; butter, ¾ of an ounce; meat-stew, 6 ounces.

Dinner: Soup (bouillon), 1 pint; roast-beef, 6 ounces; potatoes, 8 ounces; bread, 4 ounces; fruit, 4 ounces.

FRIDAY:

Breakfast: Coffee, 1 pint; bread, 6 ounces; butter, ½ of an ounce; fish-hash with vegetables, 6 ounces.

Dinner: Vegetable soup, 1 pint; meat-stew, 8 ounces; fish, 6 ounces; bread, 4 ounces; vegetables, 8 ounces; fruit, 4 ounces.

Supper: Tea, 1 pint; bread, 4 ounces; butter, ¾ of an ounce; cold meat, 4 ounces.

SATURDAY:

Breakfast: Coffee, 1 pint; bread 6 ounces; butter, ½ of an ounce; mutton chop, 6 ounces; fried potatoes, 3 ounces.

Dinner: Barley soup, 1 pint; mutton (boiled), 8 ounces; bread, 4 ounces; vegetables, 10 ounces.

The tea and coffee prepared with milk and sugar.

II. Extra Diet

Breakfast: Mutton chop or beefsteak, 6 ounces; eggs, 2.

Dinner: Chicken or game, 6 ounces; ale or wine.

Supper: Dry or dip toast, 4 ounces.

III. Milk Diet

Breakfast: Hominy or corn-meal mush, 14 ounces; milk, 16 ounces.

Dinner: Rice or tapioca (cooked), 12 ounces; milk, 16 ounces; syrup, 1 ounce; bread, 4 ounces; butter, ½ of an ounce.
Supper: Cracked wheat or oaten-grits (when cooked), 14 ounces; toasted bread, 12 ounces; milk, 16 ounces.

ALLOWANCE AND COST OF OUTLAY AT CRAIG EPILEPTIC COLONY, NEW YORK

Articles.	Present weekly per capita allowance.	Proposed change in amount.	Present weekly per capita cost.	Proposed change in cost.
Meat, etc.	3.93 pounds	.....	0.31280	
Flour	5.40 "	.....	0.10422	
Potatoes	5.20 "	.....	0.05200	
Milk	2.78 "	Increase to 3½ quarts	0.07643	0.09625
Eggs	5.04 eggs	Increase to 6 eggs	0.07560	0.09000
Sugar	15.50 ounces	.....	0.04550	
Butter	11.25 "	Increase to 12 ounces	0.15412	0.16602
Cheese	2.00 "	.....	0.01375	
Sago, tapioca, rice	2.60 "	.....	0.00800	
Oatmeal	4.90 "	.....	0.00800	
Coffee	2.70 "	.....	0.01800	
Tea	1.14 "	Decrease to 1 ounce	0.01800	0.01620
Vegetables	(?)	.....	0.10000	

Part of the provisions are from the colony farm.

Dietary of the Craig Colony of Epileptics, New York

SUNDAY:
Breakfast: Eggs, coffee, bread, butter.
Dinner: Soup, roast-beef, vegetables, corn-starch pudding, custard sauce, bread.
Supper: Tea, cookies, apple sauce, bread, butter.

MONDAY:
Breakfast: Rolled oats, coffee, bread, butter.
Dinner: Soup, mutton, potatoes, rice pudding, bread.
Supper: Eggs or baked potatoes, tea, prunes, bread, butter.

TUESDAY:
Breakfast: Stewed potatoes, coffee, bread, butter.
Dinner: Meat-stew, potatoes, vegetables, sago pudding, bread.
Supper: Corn bread or mush with syrup, tea, bread, butter, apple sauce.

WEDNESDAY:
Breakfast: Rolled oats, coffee, bread, butter.
Dinner: Soup, roast-beef, mashed potatoes, vegetables, bread.
Supper: Boiled rice, crackers, cheese, tea, butter.

THURSDAY:
Breakfast: Eggs, coffee, bread, butter.
Dinner: Soup, beef-hash, boiled potatoes, bread pudding, bread.

FRIDAY:
Breakfast: Rolled oats, coffee, bread, butter.
Dinner: Soup, fresh fish (baked), or cod-fish, boiled potatoes, stewed tomatoes, gelatin pudding, bread.
Supper: Macaroni and cheese, tea, bread, butter, dried peaches.

SATURDAY:
Breakfast: Stewed potatoes, eggs, coffee, bread, butter.
Dinner: Irish stew, apple sauce, bread.
Supper: Hot corn bread, tea, baked potatoes, dried peaches, butter.

The following vegetables to be used: Potatoes, beets, beans, peas, parsnips, celery, onions, corn, spinach, carrots, tomatoes, oyster plant. In case of emergency, the cook may substitute one article of diet for another, subject to the approval of the matron, physician, steward, or supervisor in charge of the division.

DIET FOR CHORISTER BOYS IN SAINT PAUL'S SCHOOL, BALTIMORE

Breakfast: Fruit, cereals, eggs, bread and milk. Hot bread occasionally.

Dinner—Middle of day: Soup, meat, gravies very carefully made; three or four vegetables, especially rice and potatoes; custards and simple plain desserts.

Supper: Bread and milk, hot cakes, molasses, eggs occasionally; preserves, sweets, fruit.

"We count milk as the most important article of diet. No coffee or tea at any time. Gravies well made have been found very healthful. Meat once a day only at dinner. Eggs once a day, occasionally at supper. Nuts absolutely forbidden."

DIET LIST, TUBERCULOSIS INFIRMARY, METROPOLITAN HOSPITAL, BLACKWELL'S ISLAND

(*All quantities are of cooked food, ready to serve.*)

REGULAR DIET:

Breakfast: Cereal, 8 ounces, with milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.

10 A. M.: Egg, 1 raw, with milk, 8 ounces.

11 A. M.: Cod-liver oil emulsion.

Dinner 12 noon: Soup, 12 ounces; meat, 5 to 7 ounces, or fish, 8 ounces; potatoes, 8 ounces; bread, 4 ounces; pudding, 6 ounces.

3 P. M.: Egg, 1 raw, with milk, 8 ounces.

4.30 P. M.: Cod-liver oil emulsion.

Supper: Fruit-sauce, 8 ounces; bread, 4 ounces; butter, ½ ounce; tea, 16 ounces.

8 P. M.: Milk, 8 ounces.

SPECIAL DIET (for bed patients especially):

Breakfast: Same as regular diet.

Dinner: Steak, 4 to 6 ounces; potatoes, 8 ounces; egg, 1 raw, with milk, 4 ounces; pudding, 6 ounces.

Supper: Same as regular diet.

Daily maximum allowance of milk, 32 ounces.

LIGHT DIET:

Breakfast: Cereal, 8 ounces; egg, 1 raw, with milk, 4 ounces; toast and milk.

Dinner: Same as breakfast.

Supper: Same as breakfast, with lemon-jelly or boiled rice or farina pudding replacing cereal.

Daily maximum allowance of milk, 48 ounces.

LIQUID DIET:

Boiled milk.
Albumin-water, *ad libitum.*
Broths.
Scorched farinaceous food.
Daily maximum of milk, 48 ounces.

REGULAR DIET FOR TUBERCULOSIS INFIRMARY

All quantities are of cooked food, as served.

SUNDAY:

Breakfast: Hominy, 8 ounces; with milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.

Dinner: Barley soup, 12 ounces; roast-beef, 5 ounces; potatoes, 8 ounces; bread, 4 ounces; corn-starch pudding, 6 ounces.
Supper: Stewed prunes, 8 ounces; bread, 4 ounces; butter, ½ ounce; tea, 16 ounces.

MONDAY:
Breakfast: Oatmeal, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.
Dinner: Vegetable soup, 12 ounces; corned beef, 7 ounces; potatoes, 9 ounces; bread, 4 ounces; bread pudding, 6 ounces.
Supper: Apple sauce, 8 ounces; bread, 4 ounces; butter, ½ ounce; tea, 16 ounces.

TUESDAY:
Breakfast: Hominy, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.
Dinner: Fish chowder, 14 ounces; bread, 4 ounces; coffee, 16 ounces; rice pudding, 6 ounces.
Supper: Pea or lentil soup, 12 ounces; crackers, 4 ounces; tea, 16 ounces; bread and butter.

WEDNESDAY:
Breakfast: Rolled wheat, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.
Dinner: Pot-roast-beef, or chopped roast-beef, 5 ounces; gravy; potatoes, 8 ounces; one vegetable, 4 ounces; bread, 4 ounces; farina pudding, 6 ounces.
Supper: Stewed prunes, 8 ounces; bread, 8 ounces; butter, ½ ounce; tea, 16 ounces.

THURSDAY:
Breakfast: Indian meal, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.
Dinner: Boiled mutton, 4 ounces; with broth, 8 ounces; bean polenta or lentils, 8 ounces; bread, 4 ounces; cracker pudding, 6 ounces.
Supper: Boiled rice, 6 ounces; with milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; tea, 16 ounces.

FRIDAY:
Breakfast: Oatmeal, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.
Dinner: Fresh fish, 6 ounces; potatoes, 8 ounces; bread, 4 ounces; hominy pudding, 6 ounces; tea, 16 ounces.
Supper: Apple sauce, 8 ounces; bread, 8 ounces; butter, ½ ounce; tea, 16 ounces.

SATURDAY:
Breakfast: Rolled wheat, 8 ounces; milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; coffee, 16 ounces.
Dinner: Beef-stew, 16 ounces (potato in stew); bread, 4 ounces; farina pudding, 6 ounces.
Supper: Farina pudding, 6 ounces; with milk, 4 ounces; bread, 4 ounces; butter, ½ ounce; tea, 16 ounces.

10 A. M.: } 3 P. M.: } DAILY: Egg, 1 raw, with milk, 8 ounces.
11 A. M.: } 4.30 P. M.: } DAILY: Cod-liver oil emulsion, as directed.
8 P. M.: DAILY: Milk, 8 ounces.

DIETARY OF THE SECOND HOSPITAL FOR THE INSANE OF MARYLAND FOR THE MONTH OF APRIL

SUNDAY:
Breakfast: Steak, gravy, grits, bread, syrup, coffee.
Dinner: Beef gravy, baked beans, parsnips, bread, dessert.
Supper: Roasted potatoes, cheese, crackers, ginger cakes, bread, syrup, tea.

MONDAY:
Breakfast: Beefsteak, grits, bread, syrup, and coffee.

Dinner: Soup, greens, potatoes, hominy, and bread.
Supper: Stewed prunes, bread, syrup, and tea.

TUESDAY:
Breakfast: Oatmeal, meat-stew, bread, syrup, and coffee.
Dinner: Salt meat, parsnips, greens, beans, and bread.
Supper: Stewed apples, bread, syrup, butter, and tea.

WEDNESDAY:
Breakfast: Meat-stew, potatoes, bread, syrup, coffee.
Dinner: Soup, beef, gravy, turnips, onions, bread.
Supper: Stewed prunes, bread, syrup, tea.

THURSDAY:
Breakfast: Smoked sausage, grits, bread, syrup, coffee.
Dinner: Salt meat, potatoes, greens, hominy, bread.
Supper: Ginger-bread, bread, syrup, butter, tea.

FRIDAY:
Breakfast: Salt or fresh fish, potatoes, bread, syrup, coffee.
Dinner: Fresh fish, baked beans, turnips, parsnips, bread.
Supper: Hominy, cheese, crackers, bread, syrup, tea.

SATURDAY:
Breakfast: Oatmeal, meat-stew, bread, syrup, coffee.
Dinner: Soup, greens, potatoes, onions, bread.
Supper: Fried mush, bread, syrup, butter, tea.

UNITED STATES GOVERNMENT HOSPITAL FOR THE INSANE, WASHINGTON, D. C.

Dietary for Patient on the Sick List

SUNDAY:
Breakfast: Cereal, mackerel, creamed potatoes, coffee, toast.
Dinner: Tomato bisque, lamb stew, peas, bread, pudding.
Supper: Shredded wheat, sliced bananas, tea.

MONDAY:
Breakfast: Cereal, hash, coffee, toast.
Dinner: Corn soup, pot-roast-beef, rice, parsnips, cherry ice-cream.
Supper: Creamed salmon, toast, tea.

TUESDAY:
Breakfast: Oatmeal, beefsteak, baked potatoes, coffee, toast.
Dinner: Vegetable soup, potatoes, beef-loaf, tomato sauce, junket with fruit.
Supper: Cream toast, tea, apple sauce.

WEDNESDAY:
Breakfast: Wheatlet, bacon, creamed potatoes, zwieback, coffee.
Dinner: Oyster stew, fricasseed chicken, rice, browned parsnips, wine jelly, custard sauce.
Supper: Shredded wheat, hot milk, sliced fruit.

THURSDAY:
Breakfast: Cereal, steak, potatoes, coffee.
Dinner: Potato soup, beef-stew, rice, turnips, cottage pudding.
Supper: Egg, toast, tea.

FRIDAY:
Breakfast: Cereal, mackerel, creamed potatoes, coffee, rolls.
Dinner: Bean soup, veal stew, tomatoes, ice-cream.
Supper: Raw oysters, apple sauce, tea.

SATURDAY:
Breakfast: Cereal, eggs, potatoes, toast, coffee.
Dinner: Oyster stew, roasted veal, tomatoes, rice, custard.
Supper: Broiled shad, toast, tea.

Dietary for Better Class of Patients

SUNDAY:
Breakfast: Wheatlet, ham, creamed potatoes, corn bread.
Dinner: Vegetable soup, fricasseed chicken, toast, tomatoes, potatoes, Spanish cream, sauce.
Supper: Cold ham, potato cakes, sauce, cake.

MONDAY:
Breakfast: Rolled oats, steak, onions, potatoes, batter cakes.
Dinner: Potato soup, beef-stew (baked), parsnips, potatoes, baked custard.
Supper: Sausage cakes, scalloped potatoes, apple sauce.

TUESDAY:
Breakfast: Breakfast food, lamb chops, potatoes, muffins.
Dinner: Tomato bisque, roast pork, apple sauce, boiled onions, potatoes, tapioca pudding.
Supper: Cold tongue, French-fried potatoes, evaporated peaches, doughnuts.

WEDNESDAY:
Breakfast: Rolled oats, bacon, eggs, potatoes, corn bread.
Dinner: Vegetable soup, fish, beef (roast), turnips, potatoes, frozen custard.
Supper: Beef croquettes, potato salad, cream-puffs.

THURSDAY:
Breakfast: Corn-meal mush, steak, potatoes, batter cakes.
Dinner: Vegetable soup, ham, kale, potatoes, chocolate blanc-mange, sauce.
Supper: Sliced beef, potatoes, hot biscuits.

FRIDAY:
Breakfast: Rolled oats, fresh fish, potatoes, muffins.
Dinner: Tomato bisque, oyster pie, roast-beef, corn, potatoes, floating island.
Supper: Scrambled eggs, French-fried potatoes, apple sauce.

SATURDAY:
Breakfast: Rolled oats, steak, potatoes, fried mush.
Dinner: Clear soup, roast-beef, macaroni, potatoes, lemon ice.
Supper: Fish croquettes, fried potatoes, evaporated peaches.

U. S. GOVERNMENT HOSPITAL FOR THE INSANE, ST. ELIZABETH, D. C.

FOR THE MONTH OF OCTOBER.

SUNDAY:
Breakfast: Wheatlet, baked beans, rolls. For employees and working patients, fried ham.
Dinner: Roast-beef, bread dressing, tomatoes, potatoes, dessert, coffee.
Supper: Evaporated fruit, cake.

MONDAY:
Breakfast: Fresh sausage, fried hominy, rolls.
Dinner: Boiled shoulders, pea soup, boiled rice, cabbage.
Supper: Apple jelly, rolls. For employees and working patients, dried beef.

TUESDAY:
Breakfast: Pettijohn's food, liver and bacon, rolls.
Dinner: Vegetable soup, beef-stew, lima beans, dessert.
Supper: Evaporated fruit, cinnamon bread. For employees and working patients, cold sliced shoulders.

WEDNESDAY:
Breakfast: Rolled oats, baked hash, rolls. For employees and working patients, beefsteak.
Dinner: Bean soup, corned beef, boiled rice, cabbage.
Supper: Ginger-bread, apple sauce. For employees and working patients, bologna sausage.

THURSDAY:
Breakfast: Corn-meal mush, evaporated fruit, rolls. For employees and working patients, mutton chops.
Dinner: Vegetable soup, beef pot-pie, cabbage, kidney beans.
Supper: Baked beans, biscuits. For employees and working patients, sliced corned beef.

FRIDAY:
Breakfast: Mackerel or cod-fish, potatoes, rolls.
Dinner: Fresh fish, macaroni, boiled rice, pickles, apple or peach pie, coffee.
Supper: Evaporated fruit, crackers, cheese. For employees and working patients, fresh fish.

SATURDAY:
Breakfast: Beefsteak, fried hominy.
Dinner: Vegetable soup, boiled beef, boiled cabbage, potatoes.
Supper: Evaporated fruit, fresh bread, ginger cakes. For employees and working patients, cold sliced beef.

FOR THE MONTH OF JULY.

SUNDAY:
Breakfast: Wheatlet, baked beans, rolls. For employees and working patients, fried ham.
Dinner: Roast-beef, bread dressing, tomatoes, potatoes, dessert, coffee.
Supper: Evaporated fruit, cake.

MONDAY:
Breakfast: Smoked sausage, fried hominy, rolls. For employees and working patients, fried eggs.
Dinner: Boiled shoulder, pea soup, boiled rice, cabbage.
Supper: Apple jelly, rolls. For employees and working patients, dried beef.

TUESDAY:
Breakfast: Pettijohn's food, liver and bacon, rolls.
Dinner: Vegetable soup, beefstew, lima beans, dessert. For employees and working patients, roast mutton.
Supper: Evaporated fruit, cinnamon bread. For employees and working patients, cold sliced shoulders.

WEDNESDAY:
Breakfast: Rolled oats, baked hash, rolls. For employees and working patients, veal cutlets.
Dinner: Bean soup, corned beef, macaroni, browned potatoes.
Supper: Ginger-bread, apple sauce. For employees and working patients, fish-balls.

THURSDAY:
Breakfast: Corn-meal mush, evaporated fruit, rolls. For employees and working patients, mutton chops.
Dinner: Vegetable soup, veal pot-pie, cabbage, kidney beans.
Supper: Baked beans, biscuits. For employees and working patients, sliced corned beef.

FRIDAY:
Breakfast: Mackerel or cod-fish, potatoes, rolls.
Dinner: Fresh fish, macaroni, boiled rice, pickles, apple or peach pie.
Supper: Evaporated fruit, crackers, cheese. For employees and working patients, fried eggs.

SATURDAY:
Breakfast: Beefsteak, fried hominy.
Dinner: Vegetable soup, boiled beef, boiled cabbage, potatoes.
Supper: Evaporated fruit, fresh bread, ginger cakes. For employees and working patients, breakfast bacon.

Butter should be on the table at every meal, except meals with soup, in proportion of ½ ounce to each person.

Bread supplied as desired.

Coffee, ½ ounce per capita for breakfast and dinner; tea, $\frac{1}{10}$ ounce per capita, for supper.

Syrup should be on the table for breakfast and supper every day.

Crackers should be on the table for dinner every soup-day, to be used as desired.

All bones from meat, cut out before or after cooking, should be preserved and used in the soup if necessary.

Milk and sugar are to be used in coffee and tea as desired.

Extra diet is served on the prescription of the physician only, who shall designate the special articles desired and the quantity.

Employees' Dietary

SUNDAY:
- *Breakfast:* Rolled oats, steak, potatoes, corn bread.
- *Dinner:* Vegetable soup, shoulder, kale, potatoes, coffee.
- *Supper:* Beef-stew, evaporated peaches.

MONDAY:
- *Breakfast:* Wheatlet, ham, potatoes, rolls.
- *Dinner:* Vegetable soup, roast-beef, tomatoes, potatoes, Spanish cream, coffee.
- *Supper:* Potato salad.

TUESDAY:
- *Breakfast:* Breakfast food, bacon, liver, baked potatoes.
- *Dinner:* Vegetable soup, roast pork, rice, potatoes, coffee.
- *Supper:* Cold shoulder, buckwheat cakes, apple sauce.

WEDNESDAY:
- *Breakfast:* Rolled oats, sausage, fried hominy, rolls.
- *Dinner:* Bean soup, shoulder, turnips, potatoes, cottage pudding, sauce, coffee.
- *Supper:* Baked hash, rhubarb sauce, cinnamon bread.

THURSDAY:
- *Breakfast:* Rolled oats, fried eggs, potatoes, rolls.
- *Dinner:* Vegetable soup, fish, corned beef, turnips, potatoes, peach pie, coffee.
- *Supper:* Smoked fish, baked potatoes, evaporated peaches.

FRIDAY:
- *Breakfast:* Corn-meal mush, steak, potatoes, rolls.
- *Dinner:* Vegetable soup, beef-stew (baked), parsnips, potatoes, coffee.
- *Supper:* Cold corned-beef, baked beans, rolls.

SATURDAY:
- *Breakfast:* Rolled oats, fresh fish, potatoes, rolls.
- *Dinner:* Vegetable soup, baked fish, roast-beef, corn, potatoes, floating island, coffee.
- *Supper:* Scrambled eggs, fried potatoes.

FORMER DIET-LIST OF BAY VIEW ASYLUM

This is the almshouse of Baltimore. The lists are given here not because they represent ideal diet-lists, but merely to show what the average well-conducted poor-house in this country furnishes its inmates. In this institution the inmates are well cared for, and in season the diet is varied by vegetables from the farm.

Hospital.

SUNDAY:
- *Breakfast:* Oatmeal, bread, butter, eggs, milk, tea, coffee.
- *Dinner:* Chicken soup, roast-beef and gravy, bread, tea.
- *Supper:* Bread, butter, tea, coffee, stewed apples or prunes, milk.

MONDAY:
- *Breakfast:* Oatmeal, bread, butter, eggs, milk, tea, coffee.
- *Dinner:* Beef soup, roast-beef and gravy, bread, tea.
- *Supper:* Bread, butter, tea, coffee, milk.

TUESDAY:
- *Breakfast:* Oatmeal, bread, butter, eggs, milk, tea, coffee.
- *Dinner:* Beef soup, rice, milk, bread, butter, tea.

Supper: Bread, butter, tea, coffee, milk.
WEDNESDAY:
Breakfast: Oatmeal, bread, butter, milk, tea, coffee.
Dinner: Chicken soup, beefsteak, apple sauce, bread, tea.
Supper: Bread, butter, tea, coffee, milk.
THURSDAY:
Breakfast: Oatmeal, bread, butter, eggs, milk, tea, coffee.
Dinner: Beef soup, roast-beef and gravy, bread, tea.
Supper: Bread, butter, tea, coffee, milk.
FRIDAY:
Breakfast: Bread, butter, mush and molasses, eggs, milk, tea, coffee.
Dinner: Beef soup, rice, milk, bread, butter, tea.
Supper: Bread, butter, tea, coffee, milk.
SATURDAY:
Breakfast: Oatmeal, bread, butter, eggs, milk, tea, coffee.
Dinner: Beef soup, beefsteak, bread, tea, apple sauce.
Supper: Bread, butter, tea, coffee, milk.

In addition to the foregoing, beef-tea, lemonade, and various other articles of diet are furnished from the "center-house kitchen" when necessary. On Fridays in spring and summer, when the cost is not too high, fish is given for dinner.

General House

(See note at beginning of these lists.)

SUNDAY:
Breakfast: Every day, bread and coffee; on Friday, mush and molasses are added.
Dinner: Soup, bacon, bread.
Supper: Bread, coffee, dried apples or prunes.
MONDAY:
Dinner: Soup, beef, bread.
Supper: Bread, coffee every day.
TUESDAY:
Dinner: Hash, soup, bread.
WEDNESDAY:
Dinner: Hash, soup, bread.
THURSDAY:
Dinner: Soup, beef, bread.
FRIDAY:
Dinner: Mutton soup, bread.
SATURDAY:
Dinner: Hash, soup, bread.

For Working Women.

SUNDAY:
Breakfast: Oatmeal, milk, bread, butter, coffee, tea.
Dinner: Bacon, soup, bread.
Supper: Bread, coffee, tea, stewed fruit or prunes.
MONDAY:
Breakfast: Bread, butter, oatmeal, hash, coffee, tea.
Dinner: Soup, beef, bread.
Supper: Bread, coffee, tea every day.
TUESDAY:
Breakfast: Oatmeal, Hamburg steak, bread, butter, coffee, tea.
Dinner: Bacon, hash, soup, rice, milk, bread.
WEDNESDAY:
Breakfast: Bread, butter, oatmeal, coffee, tea.
Dinner: Hash soup, bacon, apple sauce, bread.
THURSDAY:
Breakfast: Bread, butter, oatmeal, fried bacon, coffee, tea.
Dinner: Soup, beef, bread.

FRIDAY:
Breakfast: Bread, butter, salt herring, mush, molasses, coffee, tea.
Dinner: Mutton soup, bread, rice, milk.
SATURDAY:
Breakfast: Oatmeal, Hamburg steak, bread, butter, coffee, tea.
Dinner: Hash soup, bread, apple sauce.

For Farmers

SUNDAY:
Breakfast: Every day, bread, butter, ham or other meat, coffee.
Dinner: Soup, bacon, bread.
Supper: Bread, coffee, cold beef, stewed prunes or apples.
MONDAY:
Dinner: Soup, beef, bread.
TUESDAY:
Supper: Every day, bread, coffee, cold meat.
Dinner: Hash soup, bread.
WEDNESDAY:
Dinner: Hash soup, bread.
THURSDAY:
Dinner: Soup, beef, bread.
FRIDAY:
Dinner: Mutton soup, bread.
SATURDAY:
Dinner: Hash soup, bread.

For Insane Department

SUNDAY:
Breakfast: Bread, coffee, sausage (in winter months).
Dinner: Bacon, soup, bread.
Supper: Bread, coffee, molasses.
MONDAY:
Breakfast: Bread, coffee.
Dinner: Soup, beef, bread.
Supper: Bread, coffee.
TUESDAY:
Breakfast: Bread, coffee.
Dinner: Soup, beef, bread, rice.
Supper: Bread, coffee, stewed fruit.
WEDNESDAY:
Breakfast: Bread, coffee.
Dinner: Soup, hash, bread.
Supper: Bread, coffee, stewed fruit.
THURSDAY:
Breakfast: Bread, coffee, butter.
Dinner: Soup, beef, bread.
Supper: Bread, coffee, cakes, cheese, and crackers.
FRIDAY:
Breakfast: Bread, coffee, mush and molasses.
Dinner: Soup, mutton, bread.
Supper: Bread, coffee, stewed fruit.
SATURDAY:
Breakfast: Bread, coffee.
Dinner: Soup, hash, bread.
Supper: Bread, coffee, ginger-snaps, cheese.

The women are given butter on Thursdays, and those on sick diet receive butter, eggs, and oatmeal daily.

DIET OF THE ROBERT GARRETT FREE HOSPITAL FOR CHILDREN, BALTIMORE, MD.

Breakfast: Rolled oats, well cooked, one tablespoonful with milk; bread, plain or toasted, one to three slices; butter, size of Malaga grape;

egg, soft-boiled, one-half of one to one; milk, slightly warmed, 8 to 12 ounces.

Dinner: Chicken, beef, or mutton, 1 tablespoonful when cut fine; or broth (meat or oyster), 4 to 6 ounces, or meat stews with rice, 1 or 2 tablespoonfuls; baked potatoes or rice, 1 tablespoonful; bread, 1 or 2 slices; milk, 8 ounces; custard-pudding, junket, 1 tablespoonful, or oranges or baked apples, one-half of one; stewed fruit; prunes, 1 tablespoonful; cake, ginger-bread, 1 inch to $1\frac{1}{2}$ inches square.

Supper: Bread, 2 or 3 slices; butter, size of small grape; or crackers, 4 or 5; milk, 8 to 16 ounces.

The foregoing is for a child three years old. For a boy of eight or for a girl of from ten to twelve years, twice this amount is allowed. A boy of twelve requires as much as an adult. Older children prefer cold milk or cocoa now and then. One quart of milk daily is allowed for each child. Variety does not appeal to children as to older persons.

House Diet

SUNDAY:

Breakfast: Rolled oats, bread, butter, cocoa, milk (warm).

Dinner: Chicken, baked potatoes, oranges or stewed fruit, bread and milk.

Supper: Bread, butter, crackers, and milk.

MONDAY:

Breakfast: Rolled oats, eggs, toasted bread, hot milk.

Dinner: Chicken soup, rice, custard, bread and milk.

Supper: Bread and butter, crackers, and milk.

TUESDAY:

Breakfast: Rolled oats, bread and butter, cocoa, milk.

Dinner: Stew of beef, rice cakes, or junket, bread and milk.

Supper: Bread and butter, crackers, milk.

WEDNESDAY:

Breakfast: Rolled oats, eggs, toast, butter, hot milk.

Dinner: Steak or roast-beef, rice, prunes, bread and milk.

Supper: Bread and butter, crackers, milk.

THURSDAY:

Breakfast: Rolled oats, bread and butter, cocoa, milk,

Dinner: Soup or stew of mutton, rice, ginger-bread, bread and milk.

Supper: Bread and butter, crackers, milk.

FRIDAY:

Breakfast: Rolled oats, toast, eggs, butter, hot milk.

Dinner: Oyster stew, rice, bread pudding, bread and milk.

Supper: Bread and butter, crackers, milk.

SATURDAY:

Breakfast: Rolled oats, bread and butter, cocoa, milk.

Dinner: Lamb chops or roast-beef, rice, baked apples, bread and milk.

Supper: Bread, butter, crackers, milk.

Light diet is house diet without meats.

Light diet allows bread, milk, rolled oats, soup, rice, junket, etc.

Milk diet consists of from four to six ounces of milk every two or three hours, according to the age and condition of the child.

Under one year, modified milk according to physician's prescription.

All water used in diluting milk is boiled first.

All drinking-water is filtered in the city.

Spring water is used in the country.

DIET-LIST OF THE CHILDREN'S HOSPITAL OF BOSTON

House Diet—Children

Breakfast: Milk, cereals, eggs, bread and butter.

Dinner: Beef, mutton, or chicken, the last on holidays and sometimes on Sundays; mashed potatoes, boiled rice, gravy, bread or rice pudding, custard or corn-starch, fruit, bread and butter, milk.

Supper: Bread and butter, milk, sometimes eggs, milk at 10 and at 4 o'clock, and when awake during the night, as required.

Milk diet: Eight ounces of milk every two hours during day, every four hours during the night.

Liquid diet: Beef, mutton, or chicken broth, milk, beef-juice, fruit-juice.

Special diet: Each item to be ordered by House Officer: Chicken, oysters, ice-cream, gelatin, soups, fruit, egg-nog, beef-juice, milk, custard, milk toast.

All patients are to be put on milk diet unless otherwise ordered by House Officer.

Operative patients are to receive regular house diet until night before operation unless otherwise ordered.

"*Ether meal*": Bouillon, seven ounces, four hours before operation.

Diet for Nurses

SUNDAY:

Breakfast: "Force," baked beans, brown bread, toast, coffee.

Dinner: Roast turkey, cranberries, potatoes, bread and butter, celery, wine cream.

Supper: Shrimp salad, Parker House rolls, quince jam, cake, tea.

MONDAY:

Breakfast: Cereal, pressed ham, muffins, toast, coffee.

Lunch: Mock bisque soup, potato salad, doughnuts, coffee.

Dinner: Roast lamb, potatoes, lima beans, Harvard pudding, bread and butter.

TUESDAY:

Breakfast: Cereal, boiled eggs, corn-meal, gems, toast, coffee.

Lunch: Irish stew, dumplings, peanut cookies, tea.

Dinner: Roast-beef, potatoes, cream carrots, lemon jelly, cake.

WEDNESDAY:

Breakfast: Cereal, salt-fish balls, muffins, toast, coffee.

Lunch: Cold roast-beef, cheese fondu, bread and butter, cup cakes (chocolate frosting), tea.

Dinner: Roast veal, potatoes, stewed tomatoes, bread and butter, rhubarb pie.

THURSDAY:

Breakfast: Cereal, Hamburg steak, muffins, toast, coffee.

Lunch: Tomato soup, bread and butter, oranges, coffee.

Dinner: Beefsteak, potatoes, macaroni and cheese, bread and butter, caramel custard, caramel sauce.

FRIDAY:

Breakfast: Cereal, creamed fish, muffins, toast, coffee.

Lunch: Sardine, stuffed tomatoes, bread and butter, gingerbread cheese, coffee.

Dinner: Baked fish, potatoes, lettuce and radish salad, bread and butter, Washington pie.

SATURDAY:

Breakfast: Cereal, cottage pie, muffins, toast, coffee.

Lunch: Potato soup, string-beans, salad, bread and butter, oranges, tea.

Dinner: Boiled lamb, caper sauce, potatoes, canned corn, peach meringue.

Diet for Help

SUNDAY:

Breakfast: Cereal, baked beans, bread and butter, coffee. (Men servants, hot meat.)

Dinner: Roast veal, boiled onions, potatoes, bread and butter, lemon jelly, tea.

Supper: Cold ham, hot biscuit, prunes, tea.

MONDAY:
- *Breakfast:* Cereal, hash, bread and butter, coffee.
- *Dinner:* Roast lamb, beets, potatoes, blanc-mange, tea, bread and butter.
- *Supper:* Cold meat, bread and butter, canned plums, tea.

TUESDAY:
- *Breakfast:* Cereal, bacon, bread and butter, coffee.
- *Dinner:* Roast-beef, macaroni, doughnuts, coffee.
- *Supper:* Cold meat, hot rolls, apples, tea.

WEDNESDAY:
- *Breakfast:* Cereal, boiled eggs, bread and butter, coffee.
- *Dinner:* Roast pork, peas, potatoes, bread and butter, tapioca pudding, tea.
- *Supper:* Baked beans, cold meat, hot rolls, canned peaches, tea.

THURSDAY:
- *Breakfast:* Cereal, sausages, bread and butter, coffee.
- *Dinner:* Fried ham and eggs, potatoes, bread and butter, cottage pudding.
- *Supper:* Pickled pigs' feet, bread and butter, prunes, tea.

FRIDAY:
- *Breakfast:* Cereal, boiled eggs, bread and butter, coffee.
- *Dinner:* Baked fish, tomatoes, potatoes, bread and butter, rice pudding, tea.
- *Supper:* Creamed salt fish, hot rolls, apple sauce, tea.

SATURDAY:
- *Breakfast:* Cereal, bacon, bread and butter, coffee.
- *Dinner:* Irish stew, bread and butter, bananas, tea.
- *Supper:* Cold meat, bread and butter, jam, tea.

Out-Patient Department

DIRECTIONS FOR FEEDING THE BABY

"Have a milkman leave the milk daily; do not get it at a store.

"The mixed milk of a number of cows is better than one cow's milk.

"Let the milk stand five hours in a cool place (if the cream has already risen, this is not necessary), and pour off the upper quarter from the can or bottle.

"Mix the food in the following proportions:

Top-milk	ounces.
Water	ounces.
Lime-water	ounces.
Sugar-of-milk	tablespoonfuls.

"Give ounces at a feeding every hours."

(Quantities to be indicated by the physician.)

DIET-LIST

Milk.	Beef-juice.
Bread.	Soft-boiled egg.
Cracker.	Boiled rice.
Oatmeal.	Macaroni.
Oatmeal jelly.	All the water the child wants. No other food.
Potato.	

GREAT ORMOND STREET HOSPITAL FOR SICK CHILDREN, LONDON

Milk Diet

- *Breakfast, 8 o'clock:* Milk, one half pint; bread, two ounces with butter.
- *Dinner, 12 o'clock:* Rice or other milk pudding; milk, one-third pint, or beef-tea, one-half pint.
- *Tea, 4 o'clock:* Milk, one-half pint, with two ounces of bread and butter.
- *Supper, 6 o'clock, or set aside for the night and early morning:* Milk, one-half pint, with two ounces of bread and butter.

Fish Diet

Breakfast, 8 o'clock:	Milk or cocoa, with sugar, one-half pint; bread, two and one-half ounces with butter.
Dinner, 12 o'clock:	Fish, one-half ounce, boiled; bread, one ounce; mashed potatoes, three ounces; rice or milk pudding.
Tea, 4 o'clock:	Bread, two and one-half ounces with dripping, butter or treacle; milk, one-third pint.
Supper 6 o'clock, or set aside for the night and early morning:	Bread with butter or dripping; milk, one-third pint.

Meat Diet

Breakfast, 8 o'clock:	Milk or cocoa with sugar, one-half pint; bread, two and one-half ounces, with butter.
Dinner, 12 o'clock:	Roast or boiled mutton or roast-beef, two and one-half ounces; mashed potatoes, four ounces; rice and milk pudding.
Tea, 4 o'clock:	Bread, two and one-half ounces with dripping, butter, or treacle; milk, one-third pint.
Supper, 6 o'clock, or set aside for the early night and morning:	Bread, two ounces, with butter or dripping; milk, one-third pint.

Diet Ingredients.—Water or barley-water may be mixed with the milk when used as a beverage, so long as the regulation quantity of milk is given in the twenty-four hours.

Greens, carrots, or turnips, etc., should be added twice a week to all fish and meat diets that include potatoes.

Tea, sponge-cake, fruit, water-cress, mutton chops, chicken, eggs, beef-essence, wine, or brandy may be ordered as "extras" by the medical officers

Fancy Diet

"Fancy Diet" may be ordered in exceptional cases, the child being allowed whatever he can take—meat, fish, chicken, sausage, etc., with frequent variation.

All diets are adjusted for children of the age of seven years; apportionment is to be arranged in the wards according to the age and needs of the child.

RECIPES

BEVERAGES

Lime Water.—Into an earthen jar containing hot water stir a handful of fresh unslaked lime. Pour off and throw away the water as soon as it has settled. This first water contains the soluble potash salts which may be present in the lime. Add more water, allow it to settle; then decant the clear fluid and bottle it. Water may again be added to the lime, and the mixture covered and allowed to stand to be decanted as needed.

Almond Milk.—Blanch one pound of sweet and two of bitter almonds that have been soaked in cold water for twenty-four hours. This is done by pouring boiling water over the almonds, when, after a few minutes, they can easily be pressed out of their hulls. Grind the almonds in a mill or pound them in a mortar; mix with a half-pint of warm milk or water, and allow the mixture to stand two hours, after which strain through a cloth, pressing the juice out well. Thirty grams of almonds yield 200 calories of heat; 250 grams of milk yield 1700 calories.—(*Wegele.*)

Brandy-and-egg Mixture.—Rub the yolks of two eggs with half an ounce of white sugar; add 4 ounces of cinnamon water and then 4 ounces of brandy. Dose: One or two teaspoonfuls every two hours, according to age.—(*Stokes.*)

Brandy-and-egg Mixture for Infants.—Beat up well the yolk of a raw egg; ten drops of brandy; one teaspoonful of cinnamon water; one coffeespoonful of white sugar.—(*Louis Starr.*)

Cold Egg-nog.—Beat up an egg; add to it two teaspoonfuls of sugar, a glassful of milk, and a tablespoonful of brandy or good whisky; mix thoroughly.

Hot Egg-nog.—Beat up the yolk of one egg; add a teaspoonful or two of sugar and a glassful of hot milk; strain, and add a tablespoonful of brandy or old whisky, or flavor with nutmeg or wine.

Egg Broth.—Beat up an egg, and add to it half a teaspoonful of sugar and a pinch of salt; over this pour a glass of hot milk and serve immediately. Hot water, broth, soup, or tea may be used in place of milk.—*Drexel Institute.*

Egg Cordial.—Beat up the white of an egg until light; add a tablespoonful of cream and beat up together, then add two teaspoonfuls of sugar and a tablespoonful of brandy.

Caudle.—Beat up an egg to a froth; add a wineglassful of sherry wine, and sweeten with a teaspoonful of sugar; if desired, flavor with

lemon peel. Stir this mixture into a half-pint of gruel; over this grate a little nutmeg and serve with hot toast.

Albumin Water.—Beat the white of an egg until very light and strain through a clean napkin. Add six ounces of water. If intended for an infant a pinch of salt may be added. A teaspoonful or more of sugar and a teaspoonful or more of lemon juice, orange juice, or sherry wine may be added to enhance its palatableness. This drink may also conveniently be made by placing all the ingredients in a lemonade-shaker, shaking until thoroughly mixed, and then straining. Serve cold.

Apple Water.—Pour a cupful of boiling water over two mashed baked apples; cool, strain, and sweeten. Serve with shaved ice if desired.

Tamarind Water.—Pour a cupful of boiling water over a tablespoonful of preserved tamarinds; allow this to stand until cool, then strain, and serve with shaved ice.

Currant Juice.—Take an ounce of currant juice or a tablespoonful of currant jelly. Over this pour a cupful of boiling water—use cold water with the juice—and sweeten to taste.

Lemonade No. 1.—Take the juice of one lemon or three tablespoonfuls of lemon juice; add from one to three tablespoonfuls of sugar and a cupful (6 ounces) of cold water. Serve with cracked or shaved ice if desired.

Lemonade No. 2.—Pare the rind from one lemon, cut the lemon into slices, and place both in a pitcher with an ounce of sugar. Over this pour a pint of boiling water and let it stand until cool. Strain and serve with cracked ice.—(*Pavy.*)

Effervescing Lemonade.—This may be made by using a carbonated water or by adding half a teaspoonful of bicarbonate of soda or potash to a glassful of either of the foregoing lemonades.

Albuminized Lemonade.—Shake together a cupful of water, two teaspoonfuls of lemon juice, two teaspoonfuls of sugar, and the white of one egg. Serve at once.

Orangeade.—Cut the rind from one orange; over the rind pour a cupful of boiling water; then add the juice of the orange and a tablespoonful of sugar; cool, strain, and serve with shaved ice if desired. If this is too sweet, a teaspoonful of lemon juice may be added.

Imperial Drink.—Add a teaspoonful of cream of tartar to a pint of boiling water; into this squeeze the juice of half a lemon, or more if desired; sweeten to taste and serve cold. This drink is most useful in fevers and in nephritis.

Flaxseed Tea.—Add six tablespoonfuls of flaxseed to a quart of water; boil for half an hour; cool, strain, sweeten, and if desired flavor with a little lemon juice.

Linseed Tea.—To a pint of water add two tablespoonfuls of lin-

seed, the juice of half a lemon; ¼ ounce of bruised licorice root (or a piece of licorice the size of a filbert), and rock-candy to taste. Boil for one and one-half hours and strain.—(*Yeo.*)

Orgeat.—Blanch two ounces of sweet almonds and four bitter almond seeds. Add a little orange-flower water and pound into a paste; rub this with a pint of milk diluted with a pint of water until it forms an emulsion. Strain and sweeten with sugar. (A demulcent and nutritive drink.)—(*Pavy.*)

Mulled Wine.—One-fourth of a cupful of hot water, one-half inch of stick cinnamon, two cloves, a tiny bit of nutmeg, one-half cupful of port (heated), two tablespoonfuls of sugar. Boil all the ingredients except the wine and sugar for ten minutes; then add the wine and sugar, strain, and serve very hot.—(*Drexel Institute.*)

Grape Juice.—Pluck Concord grapes from the stem. Wash and heat them, stirring constantly. When the skins have been broken, pour the fruit into a jelly bag and press slightly. Measure the juice and add one-quarter the quantity of sugar. Boil the juice and sugar together and then pour into hot bottles; cork and seal with paraffin or equal parts of shoemaker's wax and resin melted together. Less sugar may be used.—(*Drexel Institute.*)

Grape Juice and Egg.—Beat the white of an egg lightly, strain through a napkin, and add to it two tablespoonfuls of grape juice. Fill a large wineglass half full of cracked ice. Pour the egg and grape juice over this, sprinkle sugar over it, and serve.

Oatmeal, Barley, or Rice Water.—*From the grain:* Use two tablespoonfuls of grain to a quart of water. The grain should have been previously soaked overnight or at least for a few hours. When required for an emergency, the soaking may be dispensed with and the grain boiled for five minutes instead. The water in which the grain was soaked should be poured off and fresh water added before cooking. The grain should be boiled for several hours, water being added from time to time to keep the quantity up to a quart. Strain. This makes a somewhat thin, watery gruel.

From prepared flours: Various brands of prepared grain flours are on the market, such, for example, as Robinson's Barley Flour. These are all somewhat similar in preparation. From two rounded teaspoonfuls to a tablespoonful of the prepared flour is added to a pint of boiling water, and this is boiled for from fifteen to thirty minutes and then strained. No previous soaking is required.

CEREAL AND CEREAL GRUELS

Either the grain itself or the specially prepared flour may be used. When the grains are used they should be spread on a clean table and all foreign substances removed. If the whole grains be used, it is well to wash them, after picking them over, with two or three changes of cold water.

Cereals are best cooked in a double boiler. The lower part should be filled about one-third full of water, and, if more is added during the cooking, it should always be boiling hot. The cereal should be cooked over the fire for ten or fifteen minutes. The water should be boiled first and then salted. The cereal is added gradually and the whole stirred to prevent it from burning. It should then be placed in a double boiler and steamed until thoroughly cooked. Cereals, like other starchy foods, require thorough cooking. Most recipes allow too short a time. Oatmeal especially should be mentioned. It develops a better flavor if cooked for three hours or more, and it is better when it is prepared the day before and reheated when used. It should be just thin enough to pour when taken out of the boiler, and when cooled should form a thin jelly.

Any cereal mush may be thinned with water, milk or cream and made into a gruel, or the gruel may be made directly from the grain or flour. Gruels should be thin, *not too sweet* nor too highly flavored, and served very hot. Milk gruels should be made in a double boiler. Gruels may be made more nutritious by the addition of whipped egg, either the white or yolk or both, and the various concentrated food products.

When cereal flours are used, the flour should be rubbed to a smooth paste with a little cold water and added slowly to boiling water, stirring constantly until it is thoroughly mixed.

LENGTH OF TIME TO COOK CEREALS

Cornmeal mush:	Boil	10	minutes,	then	steam	for	3	hours	or more.
Oatmeal:	"	"	"	"	"	"	1½	"	"
Irish Oatmeal:	"	"	"	"	"	"	8	"	"
Wheatena:	"	"	"	"	"	"	1½	"	"
Gluten mush:	"	30	"						
Steamed Rice:	Boil for one hour.								
Boiled Rice:	Boil for twenty minutes or until soft.								

Arrowroot Gruel.—Dissolve half a teaspoonful of sugar and a quarter of a teaspoonful of salt in a cupful of water, and heat. Mix half a tablespoonful of arrowroot flour with a little water and add to the heated water. Boil for twenty minutes, stirring constantly; then add a cupful of milk, bring to a boil, strain, and serve hot.

Barley Gruel.—Proceed as above, using a tablespoonful of Robinson's Barley Flour instead of arrowroot.

Oatmeal Gruel.—As above, but use oatmeal, and boil for half an hour or longer, before adding the milk.

Flour Gruel.—Proceed as in making arrowroot gruel, using instead a tablespoonful of wheat flour. Flavor with lemon juice, cinnamon, nutmeg or vanilla.

Farina Gruel.—Proceed as in making arrowroot gruel, using instead a tablespoonful of farina, and boil but ten minutes before adding the milk.

Imperial Granum Gruel.—As in the preceding, but use imperial granum instead of farina.

Cracker Gruel No. 1.—Use two tablespoonfuls of cracker crumbs and proceed as above. Cook only two or three minutes and do not strain.

Cracker Gruel No. 2.—Brown the crackers, and reduce to a powder by means of a rolling-pin. Add three tablespoonfuls of the powdered crackers to half a cupful of milk and half a cupful of boiling water; cook for ten minutes; then add one-fourth of a teaspoonful of salt and serve.—(*Drexel Institute.*)

Racahout des Arabes.—This is a French preparation with a chocolate flavor which makes a most delicious gruel. Follow the directions given for farina gruel. A homemade racahout may be made as follows: Take one pound of cocoa, one pound of confectioner's powdered sugar, one pound of rice flour, two ounces of arrowroot flour, and two ounces of sugar of milk. Mix thoroughly.

Flour Ball.—Tie half a pint of flour in a square of fine cheese cloth, making a very tight ball. Place this in a pot of boiling water and cook for four or five hours. After taking out of the cloth, peel off the outside and grate the hard ball. Dry in the oven and keep in a covered jar. This is useful for making gruels for diluting milk for infants.

Flour-ball Gruel.—Proceed as for arrowroot gruel, using two teaspoonfuls of the above grated flour rubbed up in cold water, and stir into a point of boiling water. Cook this for ten minutes.

Meal Soup.—This is prepared by browning two tablespoonfuls of wheat flour in a clean frying pan, stirring continuously. One-half pint of water and one-half pint of milk are brought to a boil, and a heaping tablespoonful of the browned flour is blended with water and then stirred into the mixture.

Cornmeal Gruel No. 1.—Use two tablespoonfuls of cornmeal and one of flour, a teaspoonful each of sugar and salt, one quart of hot water and a cupful of milk. Proceed as in making arrowroot gruel, boiling in a double boiler for three hours.

Cornmeal Gruel No. 2.—Take a tablespoonful of cornmeal and moisten with a little cold water. Stir this into a pint of boiling water to which a pinch of salt has been added. Cook for three hours in a double boiler, or for thirty minutes directly over the fire. In the latter case it must be stirred constantly.

Gluten Gruel.—Mix a tablespoonful of gluten flour with one-fourth of a cupful of cold water and stir this into one cupful of boiling salted water. Cook directly over the fire for fifteen minutes; then add one clove and cook over boiling water for a half-hour.—(*Drexel Institute.*)

Barley and Oatmeal Jelly.—*From the grain:* Prepare the grain as directed for barley water. Use from four to six tablespoonfuls of

grain to the quart of water. Boil thoroughly for several hours until the grain is thoroughly cooked. Strain and cool. The jelly when hot should be just thick enough to pour.

From the prepared flours: Use two tablespoonfuls of the flour to a pint of water. Boil from fifteen to thirty minutes and strain.

Partially Digested Cereals Prepared at the Table.—To a sauce of well-cooked oatmeal, wheaten grits, or rice, at the customary temperature, add one or two teaspoonfuls of Fairchild's Diastasic Essence of Pancreas, or fifteen grains of Fairchild's Dry Extract of Pancreas. Stir for a few minutes before eating. When the ferments are added to the very hot foods their power becomes impaired.

Tapioca Jelly.—Soak a cupful of tapioca of the best quality in a pint of cold water for two hours; when soft, place in a saucepan with sugar, the rind and juice of one lemon, a pinch of salt, and another pint of water; stir the mixture until it boils; turn into a mold and set away to cool; if desired, a glassful of wine may be added.—(*Bartholow.*)

Tapioca Soup.—Boil a pint of meat broth or stock, and, while stirring constantly, sprinkle in 3/4 ounce of previously washed tapioca. Cover the saucepan, and let it stand until the tapioca is quite soft. Skim and serve.—(*Yeo.*)

Chestnut Puree.—One pound of chestnuts are peeled, and boiled in water until the second (inside) skin comes off easily. The chestnuts are placed in a sieve until all the water drains off. They are then washed in a dish and afterward pressed through a sieve. Melt three ounces of butter in a stewpan on the fire, add a little salt and sugar—enough to cover the point of a knife—and then the chestnuts. Stew them for half an hour, stirring frequently; pour in enough bouillon so that the mush does not get too thick.—(*Wegele.*)

BREAD

Drexel Institute Bread Recipe.—For two loaves take two cupfuls of warm milk or water, two teaspoonfuls of salt and two of sugar, a tablespoonful of lard or butter, one-half cake of compressed yeast, and about four pounds of flour. Put the water or milk, salt, sugar, and fat into a bowl. Dissolve the yeast in warm water; add it and the flour gradually; when stiff enough to handle, turn the dough on a floured board and knead until soft and elastic. Put it back into the bowl, and let it rise in a warm place until it is double its bulk. Then divide it into loaves or shape into biscuits. Allow these to rise in the pan in which they are baked. Cover the bread and again allow it to double its bulk. Bake loaves one hour in a hot oven. The large amount of yeast allows the bread to be made and baked in three hours.

Brown Bread.—Take one-half cupful scalded milk, one-half cupful water, one teaspoonful salt, one-half tablespoonful butter, one-half

tablespoonful lard, two tablespoonfuls of molasses, one-half cupful white flour, sufficient Graham flour to knead, and three-quarters of a yeast cake dissolved in one-quarter of a cupful of luke-warm water. Prepare the same as white bread. Instead of Graham flour, equal parts of Graham flour and white flour may be used in kneading.

Nut-brown Bread.—The same as preceding, with one cupful of nuts chopped and added.

Whole-wheat Bread.—Dissolve a quarter of a yeast cake in a tablespoonful of lukewarm water. Pour half a cupful of hot water over half a cupful of milk, and when lukewarm add the yeast and half a teaspoonful of salt. To this add a cupful whole-wheat flour and beat for five minutes. Cover and allow this to stand in a warm place for two hours and a half. Then add whole-wheat flour gradually, mixing the mass until it can be kneaded. Knead until elastic; shape and place into baking-pans. Cover and allow to stand in a warm place until it doubles its bulk. Prick the top with a fork and bake for one hour. The oven should not be hot as for white bread.

Pulled Bread.—Use bread made with water. Make into long loaves, and as soon as baked take off the crust. Pull into stick-shaped pieces and brown slightly in a slow oven.

Zwieback.—Cut stale bread in slices and place in the oven and allow to remain until the slice is colored golden brown. Zwieback is a particularly desirable food for infants and invalids.

Bran Muffins for Constipation (*Musser and Piersol*).—Bran flour two cups, wheat flour two cups, sour milk one cup, molasses four tablespoonfuls, a little salt. Bake in muffin pans (one to be taken at each meal).

Agar-agar Crackers.—These may be made by adding fine agar flour to the flour from which the biscuit or crackers is to be made. About five grams of agar flour should be added for each biscuit.

Bran Biscuits

Bran	60 gms. (Horse bran)
Salt	¼ teaspoonful
Agar-agar, powdered	6 gms.
Cold water	100 c.cm. (½ glass)

Tie bran in cheese cloth and wash under cold water tap until water is clear. Heat agar-agar in the water (100 c.cm.) to the point of boiling. Add to washed bran the salt and agar-agar solution (hot). Mold into two cakes. Place in pan on oiled paper; then, when firm and cool, bake in moderate oven 30 to 40 minutes.

Laxative Bread

1 egg	½ cup of sugar
½ cup of molasses	1 cup of sour milk
½ cup of dry rolled oats	3 cups of Graham flour
1 teaspoonful soda	1 tablespoonful of warm water

Whip the egg and sugar together and add the molasses last.
Bake in slow oven for one hour.
Use pulverized bran if Graham flour is not to be had.
This quantity makes one loaf.

VEGETABLES

TIME TABLE FOR COOKING VEGETABLES IN WATER

(Drexel Institute)

Potatoes	25–30 min.	Spinach	30–45 min.
Carrots	35–45 "	Celery	20–30 "
Turnips	45 "	Parsnips	30–45 "
Beets (young)	45 "	Green peas	30–40 "
Beets (old)	3–4 hrs.	String-beans	1–3 hrs.
Tomatoes	1–3 "	Lima Beans	1 hr. or more.
Onions	45–60 min.	Green corn	12–20 min.
Cabbage	45–60 "	Rice	20–45 "
Cauliflower	20–30 "	Macaroni	45–60 "
Asparagus	20–30 "		

GENERAL RULES FOR COOKING VEGETABLES

Wash thoroughly; pare or scrape if skins must be removed. Stand in cold water until cooked, to keep them crisp and prevent their being discolored. Cook in boiling water; the water must be kept at the boiling-point. Use two teaspoonfuls of salt with two quarts of water; put the salt into the water when the vegetables are partially cooked. The water in which vegetables are cooked is called vegetable stock.

Fresh green vegetables require less water than others.

Cabbage, cauliflower, onions, and turnips should be cooked uncovered in a large amount of water.

All vegetables must be drained as soon as tender. Season with salt and pepper and serve hot with butter or sauce.

The color may be kept in green vegetables, such as spinach, by pouring cold water through them after draining.

Cold vegetables may be used for salads or may be placed in a baking-dish with one-half the quantity of sauce (2 cupfuls vegetables and 1 cupful sauce), covered with buttered crumbs, and browned in a hot oven.

Sauce for Vegetables:

3 tablespoonfuls of butter
3 tablespoonfuls of flour
1 teaspoonful of salt
White pepper
1 cupful of milk
1 cupful of stock

Salad Dressing for the Obese.—Two tablespoonfuls vinegar, a pinch of salt and paprika, one-quarter teaspoooful mustard (dry), one teaspoon chives chopped fine or parsley, one teaspoonful tomato catsup or, if preferred, Walnut or Worcestershire sauce. Rub the salad bowl with an onion or garlic, mix the salt, mustard, and paprika together. Add the vinegar, catsup and chives and pour over the salad. A finely chopped hardboiled egg may be used from time to time.

SOUPS WITHOUT MEAT

(Drexel Institute)

These soups are thickened by using butter and flour; this prevents a separation of the thicker and thinner parts of the soup. The butter should be heated until it bubbles, the flour and seasoning added, and enough of the hot liquid to make a smooth sauce thin enough to pour easily; this should be poured into the rest of the hot liquid and cooked in a double boiler until the soup is of the proper consistency.

In soups made of dried peas and beans, soda is used to soften the casein; it is also used in tomatoes to neutralize the acid. These soups must be served in hot dishes as soon as ready. Crisp crackers, croutons, or soup sticks may be served with them.

Crisp Crackers:

Split and butter thick crackers and brown in a hot oven.

Cream-of-Tomato Soup:

1 can tomatoes	⅓ cupful of flour
¼ teaspoonful soda	3¼ teaspoonfuls of salt
⅓ cupful of butter	½ teaspoonful of white pepper

1 quart of milk.

Stew the tomatoes slowly one-half to one hour, strain, and add soda while hot; make a white sauce and add the tomato juice. Serve immediately.

Cream-of-Celery Soup:

1½ cupfuls of celery	2 tablespoonfuls of butter
1 pint of water	½ cupful of flour
1 cupful of milk	½ teaspoonful of salt
1 cupful of cream	⅛ teaspoonful of white pepper

Cook the celery in the boiling water until very soft; strain and add the hot liquid; make a white sauce and cook until it is thick cream.

Cream-of-Potato Soup:

3 potatoes	Yolks of 2 eggs
2 cupfuls of milk	1 teaspoonful of salt
½ cupful of cream	Pepper

½ teaspoonful of onion juice.

Cook the potatoes until soft, drain, mash, add the hot liquid, and strain; add the beaten yolks and seasoning. Cook in a double boiler until the egg thickens, stirring constantly. Serve immediately.

Oyster Stew:

1 cupful of milk	¼ teaspoonful of salt
1 pint of oysters	1 tablespoonful of butter

Pepper.

Heat the milk. Cook and strain the oyster juice. Add the oysters, which have been rinsed, and cook until the edges curl. Add seasoning, butter, and hot milk. Serve at once. This soup may be thickened with a tablespoonful of flour cooked in the butter as for white sauce.

Vegetable Soup:

1 handful of spinach.
1 large beet.
2 carrots.

Chop fine and add to one quart of water. Boil two hours, add water to make quantity up to one quart, and strain. Add salt if desired. This contains a large amount of inorganic salts.

MILK PREPARATIONS

Partially Peptonized Milk.—Into a clean graniteware or porcelain-lined saucepan place one pint of milk, four ounces of water, and the contents of one of Fairchild's peptonizing tubes, or five grains of pancreas extract and fifteen grains of bicarbonate of soda. Heat gradually until it boils, stirring constantly. Boil gently for ten minutes, strain into a clean bottle, cork, and keep in a cool place. Before using shake the bottle well; serve hot or cold. Prepared in this way it will not become bitter.

Peptonized Milk (Cold Process.)—Mix milk, water and peptonizing agents as directed in the preceding recipe, and immediately place the bottle on ice. Use when ordinary milk is required. This is particularly suited for dyspeptics and individuals with whom milk does not, as a rule, agree. The flavor of the milk remains unchanged.

Peptonized Milk (Warm Process.)—Put in a glass jar one pint of milk and four ounces of cold water; add five grains of extract of pancreas and fifteen grains of bicarbonate of soda. After mixing thoroughly, place the jar in water as hot as can be borne by the hand (about 115° F.). This should be heated for from six to twenty minutes. At the end of this time it may be placed upon ice until required. The contents of one of Fairchild's peptonizing tubes may be used in place of the pancreas extract. If the milk is to be kept for any length of time, it should be brought to a boil, to prevent the formation of too much peptone, which renders the milk bitter.

Hot Peptonized Milk.—Mix together the usual peptonizing ingredients and add a pint of fresh cold milk; after thoroughly shaking the bottle, place it on ice. When needed pour out the required amount, heat it, and drink it as hot as it can agreeably be taken. If required for immediate use, the ingredients may be mixed together in a saucepan and slowly heated to the proper temperature.

Effervescent Peptonized Milk.—Put some finely cracked ice in a glass; fill it half-full of Apollinaris, Vichy, or siphon water, and immediately add the peptonized milk. Drink while effervescing. Brandy may be added if desired.

Specially Peptonized Milk.—This is to be used in the preparation of jellies, punches, and all recipes where the milk is to be mixed with fruit juices or acids. Prepare according to the hot process; keep the milk at a temperature of 115° F. for one hour; pour into a saucepan and bring to a boil. If required hot, this may be used immediately, or it may be set aside on ice, to be used later. If not heated for an hour, the milk will curdle on being mixed with an acid. If not boiled, the peptonizing ferment will digest gelatin and prevent the formation of jelly.

Peptonized Milk Jelly.—Soak well half a box of Cox's gelatin in four ounces of water. Take one pint of hot *specially* peptonized milk

and add four ounces of sugar. Put in the gelatin and stir until it is dissolved. Pare one fresh lemon and one orange, and add the rinds to the mixture. Squeeze the lemon and the orange juice into a glass, strain, and mix with two or three tablespoonfuls of St. Croix rum, or brandy, if preferred. Add the juices to the milk, stirring constantly. Strain, and allow it to cool to the consistence of syrup; when almost ready to set, pour into cups and set in a cold place. Do not pour the milk into moulds until the mixture is nearly ready to set, otherwise it will separate in setting.

Peptonized Milk Punch.—In the usual milk punch recipes the *specially* peptonized milk may be used in place of ordinary milk. Take a goblet one-third full of finely crushed ice; pour on it a tablespoonful of rum and a dash of Curacao, or any other liquor agreeable to the taste. Fill the glass with peptonized milk; stir well, sweeten to taste, and grate a little nutmeg on top.

Peptonized Milk Lemonade.—Take a glass one-third full of cracked ice; squeeze into this the juice of a lemon, and add two or three teaspoonfuls of sugar dissolved in water. Fill the glass with fresh *specially* peptonized milk and stir well. If preferred, equal parts of milk and of an effervescent mineral water may be used. Pour the water on the lemon juice and ice, and immediately fill the glass with milk.

Peptonized Milk Gruel.—Mix a teaspoonful of wheat flour, arrowroot flour, or Robinson's Barley Flour with half a pint of cold water. Boil for five minutes, stirring constantly. Add one pint of cold milk and strain into a jar; add the usual peptonizing ingredients; place in warm water (115° F.) for twenty minutes, and then upon ice.

Junket, or Curds and Whey.—Take a half pint of fresh milk; add one teasponful of Fairchild's Essence of Pepsin and stir, just sufficiently to mix. Pour into custard cups, and let it stand until firmly curdled. It may be served plain or with sugar and grated nutmeg. It may be flavored with wine, which should be added before curdling takes place.

Junket with Egg.—Beat one egg to a froth, and sweeten with two teaspoonfuls of white sugar; add this to a half-pint of warm milk; and then add one teaspoonful of essence of pepsin and let it stand until curdled.

Cocoa Junket.—Put an even tablespoonful of any good cocoa and two teaspoonfuls of sugar into a sauce-pan; scald with two tablespoonfuls of boiling water and rub into a smooth paste; then stir in thoroughly one-half pint of fresh, cool milk; heat this mixture until it is lukewarm—not over 100° F.—then add one teaspoonful of Fairchild's Essence of Pepsin and stir just enough to mix; pour quickly into small cups or glasses, and let it stand until firmly curdled, when the junket is ready for use. It may be placed on ice and eaten cold; as a dessert it may be served with whipped cream.—(*Fairchild.*)

Coffee Junket.—Dissolve two teaspoonfuls of sugar in two tablespoonfuls of clear, strong coffee; mix this thoroughly with one-half pint of fresh, cool milk; add a teaspoonful of Fairchild's Essence of Pepsin as directed above, and serve in the same way.

Iodized Junket.—Prescribe a saturated solution of potassium iodid and also a bottle of essence of pepsin. Take one-half teacupful of milk and add the required number of drops of the iodid solution. Heat the milk luke-warm and add two or three teaspoonfuls of the pepsin and let it stand until curdled. This will be found useful where it is difficult to administer the iodid by ordinary methods.

Vanilla, Bitter Almond, or Strawberry Junket.—Add the flavoring extract to the cold milk and then prepare in the usual way. One half teaspoonful of vanilla or bitter almond extract or a tablespoonful of a pure concentrated strawberry syrup should be allowed to a half-pint of milk.

Milk Lemonade.—Take two ounces of sugar, five ounces of boiled milk, one-half lemon, or two ounces of white wine, five ounces of boiling water, and the rind of half a lemon. Pour the boiling water over the peel and the sugar; allow it to cool, add the milk, and then the lemon juice or wine. Strain after ten minutes.

Milk Punch.—Shake together in a lemonade-shaker a glass of milk, a tablespoonful of rum, brandy, or good old whisky, and two teaspoonfuls of sugar. After it has been poured into a glass a little nutmeg may be grated over the top.

Milk Porridge.—Mix a tablespoonful of flour with one-fourth cupful of cold milk and stir into one-fourth cupful of hot milk; if desired, add two raisins cut into quarters. Cook over boiling water for one hour, and add one-quarter teaspoonful of salt just before serving.—(*Drexel Institute.*)

Whey.—Take a half-pint of fresh milk heated lukewarm (115° F.), add one tablespoonful of essence of pepsin, and stir just enough to mix. When this is firmly coagulated, beat up with a fork until the curd is finely divided and then strain. For flavoring purposes lemon juice or sherry wine may be added.

Grape Juice Whey.—Make whey as in the above recipe. To this add the juice of an orange and a quarter of a pint of grape juice. Strain again if necessary. This may be served hot or on cracked ice. It may be sweetened if desired.

Cream-of-tartar Whey.—Add a heaping teaspoonful of cream of tartar to a pint of boiling water. Strain, sweeten to taste, and serve cold.—(*Pavy.*)

Wine Whey.—Cook together a cupful of milk and half a cupful of sherry wine. As soon as the curd separates, strain and sweeten. This may be eaten hot or cold.

Lemon Whey.—This is made in the same way as the foregoing recipe, using three tablespoonfuls of lemon juice instead of the wine.

Kumiss No. 1.—Take a quart of skim milk, one-fifth of a cake of yeast, and two tablespoonfuls of sugar. Heat the milk. Dissolve the yeast in a little water and mix it with the sugar and lukewarm milk. Pour the mixture into strong bottles, stopper them tightly with new corks, and tie down the corks with stout twine. Shake the bottles well and place in a refrigerator; this will allow the mixture to ferment slowly. After three days lay the bottles on their sides, turning them occasionally. Five days are required to complete the fermentation; the kumiss is then at its best.—(*Drexel Institute.*)

Kumiss No. 2.—Pour into wired bottles one quart of fresh milk, half an ounce of sugar, a piece of fresh yeast cake half an inch square, and keep at a temperature between 60° and 70° F. for one week, shaking five or six times a day; then put upon ice.—(*Holt.*)

Kefir With Kefilac Tablets.—Pour into a well cleaned quart bottle one pint of pure milk, which has been boiled and cooled to lukewarm temperature.

Put one Kefilac tablet, crushed, into the bottle and shake thoroughly until dissolved. Cork tight with a good, clean cork.

Place the bottle at a temperature of the ordinary living room (70°–75°), lying on its side. As fermentation advances, a curd will be observed forming in the bottle. Shake thoroughly four to five times a day until ready for use. This curd re-forms when the bottle is at rest, and should be shaken thoroughly each time the contents are used.

After the first day a slightly sour, after the second day medium strong, sweetish sour, and after the third day, a strong, sour tasting, lightly foaming kefir is produced. One day old kefir is slightly laxative. For general use, forty-eight-hour kefir is recommended.

If the kefir does not turn over right, as sometimes happens, when impure milk is used or whenever changeable weather prevails in the summer, it is necessary to cleanse the bottle thoroughly, and boil it in a soda solution for five minutes before using again.

If a larger quantity of kefir than one pint is to be made, one tablet should be used for each extra pint, and this proportion continued. It should be carefully noted that the bottle should be twice the size of its contents, in order to provide for fermentation. After fermentation is complete, which is about forty-eight hours, kefir remains good for several days, if kept on ice.

Kefir may be used freely, and to the same extent as ordinary milk. From one pint to three quarts per day, according to requirements of the individual.

Milk Mixture.—This is made of cream, two parts; milk, one part; lime water, two parts; sugar water, three parts (seventeen and three-fourths drams of milk sugar to a pint of water).—(*A. V. Meigs.*)

Milk-and-cinnamon Drink.—Add a small amount of cinnamon to

the desired quantity of milk and boil it. Sweeten with sugar and add brandy if desired.—(*Ringer.*)

Albuminized Milk.—Shake in a covered jar or lemonade-shaker a cupful of milk, a tablespoonful of lime-water, and the white of an egg. Sweeten, flavor as desired, and serve at once.

Milk-and-cereal Waters.—A most valuable method of preparing milk for invalids with whom it disagrees is to mix equal parts of milk and thoroughly cooked barley, rice, oatmeal or arrowroot water and boil them together for ten minutes. This may be served plain, or flavored by cooking with it a cut-up raisin, a sprig of mace, or a piece of stick cinnamon, which should be strained out before serving.

Irish Moss and Milk.—Soak about two tablespoonfuls of Irish moss for five minutes and wash thoroughly in cold water. Add to a cupful of milk and soak for half an hour; then heat slowly, stirring constantly, and then boil for ten minutes, preferably in a double boiler; strain, and pour into cups and cool. This may be served while hot, and may be rendered more nutritious by the addition of the white of an egg stirred into it just before serving.

Egg and Buttermilk Mixture.—Lightly beat the white of one egg and from one to four ounces of cream. Pour into a glass and fill with fresh buttermilk. Stir well.

Milk with Other Diluents.—Milk may be diluted with advantage in many cases by adding lime water, or Vichy, Apollinaris or some other sparkling table water. From one-half to one-eighth the total volume may be added.

EGGS

Eggs are exceedingly valuable as food for invalids. They should always be fresh. When received they should be washed and then placed in a cool place. They should not be kept with any article of food having an odor, as they absorb such odors and the taste is thereby impaired. Stale eggs will not sink, and if held to a bright light they show a dark spot. The yolk of an egg that has been broken may be kept fresh by placing it (unbroken) in a cupful of cold water. This should be set in a cool place. This will keep it fresh for twenty-four hours or more.

Eggs and all other albuminous foods should be cooked at as low temperature as possible, in order to avoid rendering them tough.

Eggs are best cooked in the shell as follows:

Soft-cooked Eggs.—Place in a pint of boiling water, remove from the fire, and allow to stand for eight or ten minutes. If the egg is very cold to start with, it will take a little longer.

Hard-cooked Eggs.—Place in water, bring to a boil, and then set on the back part of the stove for twenty minutes.

Eggs should be served as soon as cooked, and the dishes should be warmed and ready.

EGGS AND MILK

Rules for Custards.—The eggs should be thoroughly mixed but not beaten light, the sugar and salt added to these, and the *hot* milk added slowly. Custards must be cooked over moderate heat; if a custard curdles, put it in a pan of cold water and beat until smooth. Custards should always be strained.—(*Drexel Institute.*)

Soft Custard.—Take a pint of milk, the yolks of two eggs, two tablespoonfuls of sugar, and a pinch of salt. Mix all except the milk in a bowl. Heat the milk to the boiling-point and add constantly. As soon as mixed, pour into the saucepan in which the milk has been heated and cook from three to five minutes, stirring constantly until it thickens. Strain, and pour into a cold bowl, and flavor with from half to one teaspoonful of vanilla, a teaspoonful or more of sherry, or other flavoring material as desired. Custards may be cooked to advantage in a double boiler.

Chocolate Custard.—Melt half an ounce of Baker's chocolate and add to the milk, and proceed as above.

Steamed Custard.—Mix the above, using the whole eggs instead of the yolks. Strain, pour into cups, and steam over boiling water until firm.

Baked Custard.—Proceed as above, but pour the custard into baking-cups. Place the cups in a deep baking-pan and fill the pan nearly as high as the cups with boiling water. Place in the oven and bake twenty minutes or longer, according to the size of the cup. When done a clean knife thrust into the custard comes out clean; if it is not done, it comes out covered with milk.

Egg Pudding.—Beat well the yolk of one egg, add half cupful of milk, a spoonful of sugar and a little vanilla extract; then beat the white of the egg very stiff and stir in lightly.

Apple Snow.—Apple sauce sweetened and beaten up with white of egg, whipped cream on top. Flavor with vanilla.

MEATS

General Rules for Preparing Meat.—Meat must be weighed, trimmed, and wiped with a damp cloth. It should be removed immediately from the paper in which it was wrapped and placed in a cool place. Only tender cuts of meat should be broiled, pan-broiled, or roasted. When meat is to be cooked by any of these methods, it should first be seared, and then the temperature slightly lowered; by searing, the albumin on the outer surface of the meat is hardened and the meat is thus cooked in its own juices.

Tough meat should be cooked in water; boiling water hardens the albumin on the outer surface of the meat and prevents the juices from escaping. Meat should be put in boiling water and the water allowed to boil for ten or fifteen minutes; then the cooking should be allowed

to proceed at a low temperature until the meat is tender. If the water bubbles, it is too hot. Cooked in this way tough meat will become tender. The time required for roasting or cooking in water varies with the weight and quality of the meat.

For roasts weighing less than 8 pounds allow ten minutes to the pound and ten minutes extra; for those weighing from 8 to 12 pounds, allow twelve minutes to the pound and twelve minutes extra; for those weighing over 12 pounds, allow fifteen minutes to the pound and fifteen minutes extra. For meat weighing less than 10 pounds, to be cooked in water, allow twenty minutes to the pound and twenty minutes extra.

The time required for broiling meat varies with the thickness of the meat.

Stock and broth are prepared by prolonged soaking of the meat in cold water and then cooking it at a low temperature for several hours, allowing it to cool uncovered. The meat that remains after straining may be utilized in various ways, adding a little fresh meat to give it flavor.

The fat must not be removed from stock or broth, for it excludes the air and prevents decomposition. It must, however, be entirely removed before the stock or broth is used; this fat may be used in place of drippings. The trimmings of fat from meat should be clarified. Small globules of fat may be removed from cold broth with a cloth that has been dipped in boiling water and then wrung dry. Fat may be removed from hot broth by means of tissue-paper or a slice of bread.

Cooking Tender Meats.—*Roasting.*—Skewer the meat into shape. Place it on a rack in a meat pan, into the bottom of which pieces of fat from the meat have been placed. Put in a hot oven on the grate for ten minutes, to sear the meat. If desired it may be seasoned with salt and pepper. Then remove to the floor of the oven and baste every ten minutes until it is done.

Broiling.—Remove extra fat from the meat and grease the broiler with a part of the fat. Broil over a clear fire; sear, and then turn every ten seconds. Chops one inch thick should be cooked for five minutes. A steak two inches thick should be cooked for ten minutes. Season and serve on a hot platter.

Pan-broiling.—Remove all the fat from the meat. Heat a frying-pan very hot, but use no fat. Sear the meat on both sides, and then cook more slowly until it is done. Stand chops up on their edges to brown. Keep the pan free from fat. The time required for pan-broiling is the same as that required for broiling.—(*Drexel Institute.*)

GENERAL RULES FOR SOUPS

Both meats and vegetables should be cut into small pieces. The soup should be started with cold water poured over the meats and the heat applied gradually and the soup allowed to simmer, in order to dissolve as much of the nutriment as possible. If heated rapidly the albumin in the meat coagulates, and little but the extractives passes into the soup. The vegetables are added when the soup is nearly done.

Remove the fat by skimming, by using blotting-paper, by straining through a cloth wet in cold water, or, best of all, by cooling the soup when all the fat rises to the top, when it can be easily removed.

Clear soups may be rendered more nutritious by the addition of sago or of some cereal, as barley or rice. These may also be added with advantage to many thick soups.

Soups should always be served hot. Soup jellies are served cold, and in hot weather may be substituted for warm soups.

Soups may also be made from soup stocks, which may be prepared in any quantity and kept for several days. Stocks may be made from any meat. Those made from chicken or veal are light in color, and those from beef and mutton somewhat darker. Stocks may also be made by using the bones from any kind of meats.

Soup Stock.—To make stock, use chicken or several pounds of bones with some meat attached, or a pound of lean meat and one quart of water. Cut-up vegetables may be added as desired. For flavoring add a sprig of parsley and of celery, a peppercorn, a small onion, and a scant teaspoonful of salt. Any of the flavoring vegetables may be omitted as desired or others added. The meat should simmer for several hours, until but half the quantity of water remains. Then add the other ingredients, simmer half an hour longer, strain and cool. Remove the fat.

Soup Stock from Beef Extract.—Cook the other ingredients, except the salt, as given above, for half an hour, using a quart of water. Then add a teaspoonful of beef extract and a quarter of a teaspoonful of salt.

Soup from Stock.—Rice, tapioca, or whatever is desired is cooked and the stock added, with additional seasoning as thought necessary. Cream, yolks of eggs, Irish moss, cornstarch or arrowroot may be added to render the soup more nutritious.

Chicken Broth.—Take one pound of chicken and a pint of cold water. Clean the fowl, cut it into pieces, and remove the skin. Separate the meat from the bone and chop the meat very fine. Place with the bones—if large, they should be broken—in the water and soak for an hour. Cook over hot water for four or five hours at a temperature of 190° F. Strain and add salt. Water must be added

from time to time to keep the quantity up to a pint. Remove the fat. If the broth is to be reheated use a double boiler.

Sweetbread Soup.—The sweetbread is soaked in cold water for one hour, the water being renewed frequently during this time. It is then boiled for one hour in slightly salted water or beef broth, to which one may add one teaspoonful of julienne to improve the taste. After it is soft the sweetbread is taken out of the beef broth and all blood-vessels and skin are removed. It may now be cut into pieces the size of a walnut and put on a plate, over which the beef broth is poured, or the sweetbread may be forced through a sieve, beef broth poured over this, and the whole put on the fire again until it boils, after which the soup may be served. This latter process is to be recommended in the case of dyspeptics.—(*Wegele.*)

Meat Broth (Beef, Veal, Mutton, or Chicken).—Cover one pound of chopped lean meat with one pint of water and allow it to stand for from four to six hours. Then cook over a slow fire for an hour until reduced to half the quantity. Cool, skim, pour into jar and strain.

Veal Broth.—Pour a pint of water on a half-pound of finely chopped lean veal and allow it to stand for three hours. Boil for a few minutes, strain, and season with salt.

Clam or Oyster Juice.—Cut the clams or oysters into pieces and heat for a few minutes in their juice. Strain through muslin and serve while hot. In straining great care must be taken that sand does not pass through the muslin. The juices should be diluted and may be frozen.—(*Drexel Institute.*)

Clam Broth.—Wash three large clams very thoroughly, using a brush for the purpose. Place in a kettle with half a cupful of cold water. Heat over the fire; as soon as the shells open the broth is done. Strain through muslin, season, and serve.—(*Drexel Institute.*)

Mutton Broth with Vegetables.—Allow one pound of neck mutton to each pint of water; add carrots, turnips, onions and barley; let all simmer together for three hours.

Mutton Broth without Meat.—Cook two "shank-ends" in a pint of cold water, and vegetables as directed in the foregoing recipe; simmer for three hours and strain.

Beef Tea No. 1.—Cut up a pound of lean beef into pieces the size of dice; put it into a covered jar with two pints of cold water and a pinch of salt. Let it warm gradually and simmer for two hours, care being taken that it does not at any time reach the boiling-point.—(*Yeo.*)

Beef Tea No. 2.—Put a pound of finely mixed beef with a pint of cold water into a suitable vessel. Let it stand for an hour, stirring occasionally. Put the vessel containing the beef into a saucepan of water, place it over the fire, and allow the water to heat gently for an hour (or the vessel containing the beef tea may be put into an ordi-

nary oven for an hour). Pass the beef tea through a strainer. A fine sediment appears in the fluid, and this should be drunk with the liquid. Flavor with salt. At no time should beef extract be exposed to a temperature of more than 170° F.—(*Pavy.*)

Beef Tea No. 3.—Chop fine a pound of beef free from fat, tendons, etc., and digest with a pint of cold water for two hours. Let it simmer on the stove for three hours at a temperature never above 160° F. Replace the water lost by evaporation by adding cold water, so that a pint of beef tea shall represent a pound of beef. Strain and carefully express all fluid from the beef.—(*Bartholow.*)

Beef Tea with Oatmeal.—Mix thoroughly one tablespoonful of groats with two of cold water; add to this a pint of boiling beef tea. Boil for ten minutes, stirring constantly, and strain through a coarse sieve.—(*Yeo.*)

Beef Tea, Flavored.—Beef tea may be flavored agreeably by boiling in it a pinch of mixed herbs, a bay-leaf, or a bit of onion, carrot, turnip, or celery and a few peppercorns. The roots should either be chopped small or be scraped to a pulp before being added to the broth.—(*Yeo.*)

Beef Juice.—Broil quickly pieces of the round or sirloin of a size to fit the opening in a lemon squeezer. Both sides of the beef should be scorched quickly to prevent the escape of the juices, but the interior should not be fully cooked. As soon as they are ready the pieces of meat should be squeezed in a lemon squeezer previously heated by being dipped in hot water. As it drips the juice should be received into a hot wineglass; it should be seasoned to the taste with salt and a little Cayenne pepper, and taken while hot.—(*Bartholow.*)

Cold Beef Juice.—Cover one pound of finely chopped lean beef with eight ounces of cold water and allow it to stand for eight or ten hours. Squeeze out the juice by means of a muslin bag; season with salt or sherry wine and drink cold or slightly warmed. It may be added to milk, care being taken that the milk be not too hot before the juice is added.

Iced Meat Extract.—Cut into pieces the size of a hand one kilo of fresh beef; wrap in a coarse, lattice-like linen bag, put under a lever press, and press slowly. The juice should be caught in a porcelain dish. This is done best by a druggist. By this method about 500 gm. of juice are obtained. The juice is mixed with 250 gm. of sugar, 200 gm. of freshly expressed lemon juice (this last is best omitted in the case of dyspeptics), and 20 gm. of cognac containing vanilla extract; stir in well the yolks of three eggs; the entire mixture is then placed in a freezer.—(*v. Ziemssen.*)

Raw-meat Juice.—Add to finely minced rump steak cold water, in the proportion of one part of water to four parts of meat. Stir well together, and allow it to stand for half an hour. Forcibly express

the juice through muslin, twisting it to get the best results.—(*Cheadle.*)

Succus Carnis (Meat Juice).—Cut up the meat into small bits, arrange in layers separated from one another by coarse linen, and then place in a powerful press. From each kilogram of meat about 230 gm. of a blood-red juice are obtained. This contains about 6 per cent. of albuminates. Its taste is similar to that of raw meat; its flavor may be improved by the addition of salt and beef tea not hot enough to coagulate the albumin.—(*Pettenkoffer and Voit.*)

Leube-Rosenthal Meat Solution.—Chop 1 kilo of beef into fine pieces, mixing with it a liter of water and add 20 grams of pure hydrochloric acid and boil mixture ten to fifteen hours in a Papin pot. The mass which is obtained is crushed, boiled fifteen hours longer, neutralized with pure sodium carbonate and evaporated to a mush.

Beef Essence.—Chop up very fine a pound of lean beef free from fat and skin; add a litle salt, and put into an earthen jar with a lid; fasten up the edges with a thick paste, such as is used for roasting venison in, and place the jar in the oven for three or four hours. Strain through a coarse sieve, and give the patient two or three tablespoonfuls at a time.—(*Yeo.*)

American Bouillon (American Broth).—Place in a tin vessel that can be sealed hermetically alternate layers of finely minced meat and vegetables. Seal it, and keep it heated in a water bath (bain marie) for six or seven hours, and then express the broth.—(*Yeo.*)

Bottle Bouillon.—Cut beef, free from fat, into squares. Place these in a stoppered bottle, put the bottle in a basin of warm water, heat slowly, and boil for twenty minutes. There will be about an ounce of yellowish or brownish fluid for each three-quarters of a pound of meat used. The flavor is that of concentrated bouillon.—(*Uffelmann.*)

Peptonized Oysters.—To half a dozen oysters with their juice add half a pint of water and boil for a few minutes. Pour off the broth and set it aside. Mince the oysters, and with the aid of a potato-masher reduce to the consistence of a paste. Place this with the broth in a glass jar and add fifteen grains each of extract of pancreas and of bicarbonate of soda and mix. Allow this to stand in hot water (115° F.) for one and one-half hours. Pour into a saucepan and add half a pint of milk; heat over a slow fire to boiling-point. Flavor with salt and pepper and serve hot. Let the heating be done gradually, and be careful to bring the mixture to a boil before taking it from the fire.—(*Fairchild.*)

Peptonized Beef.—Cover one-fourth of a pound of finely minced lean beef (or beef and chicken mixed) with half a pint of cold water. Cook over a slow fire until it has boiled for a few minutes, stirring constantly. Pour off the broth and rub or pound the meat to a paste. Put meat and broth and half a pint of cold water in a glass

jar, and add twenty grains of extract of pancreas and fifteen grains of bicarbonate of soda. Mix well and keep in a warm place—at about 110°–115° F.—or place it in warm water and allow it to stand three hours, stirring or shaking occasionally. Boil quickly; strain or clarify with the white of an egg and season with salt and pepper. If desired, it need not be strained, as the small particles of meat are usually easily digested. Cereals may be added, boiling with half the amount of water previously directed, and mixing all together before peptonizing. At the end of three hours the mixture must be boiled or it will spoil.—(*Fairchild.*)

METHODS OF PREPARING RAW BEEF

Meat given raw should always be perfectly fresh and very finely divided. Scrape the meat with a sharp knife, which will separate the coarser fibers. If the resulting mass is stringy, pass through a fine sieve. This may be seasoned with salt and pepper, and served on toast, crackers, or bread and butter. It may be rolled into small balls and swallowed. These may be flavored as desired. They may also be slightly browned by rolling about rapidly in a hot saucepan, care being taken not to change any but the outside of the ball, and that but slightly. Scraped beef may be served as a liquid or semisolid food. Mix it with an equal quantity of cold water until it is quite smooth. Place in a double boiler and cook until thoroughly heated, stirring constantly. Add a little salt and pepper and serve at once. This may be made thicker by adding less water.

Raw Meat with Milk and Sugar.—Scrape half a pound of rump steak with a knife until all the pulp is removed; sweeten with sugar, breaking the lumps of sugar with the meat in a basin with a small wooden spoon. Add slowly as much milk as will make it about the thickness of arrowroot; flavor with brandy. If any fiber of the meat remains, strain through a gravy strainer. The mixture should be perfectly smooth.—(*Ringer.*)

Raw-beef Soup.—This is made by chopping up one pound of raw beef and placing it in a bottle with one pint of water and five drops of strong hydrochloric acid. This mixture is allowed to stand on the ice overnight, and in the morning the bottle is placed in a pan of water at 110° F., and kept at about this temperature for two hours. It is then placed in a stout cloth and strained until the mass that remains is almost dry. The filtrate is given in three portions daily. If the taste of the raw meat is objectionable, the meat may quickly be roasted on one side and the process completed in the manner previously described.—(*Weir Mitchell.*)

Egg Gruel.—Take one cupful of hot beef broth made with "Soluble Beef," one egg, and one-half teaspoonful of salt. Beat the white and the yolk of the egg separately; add the hot beef broth gradually to the

yolk, stirring continually. Whip the white to a stiff, dry froth with the salt, and beat it into the hot broth. Return to the double boiler and reheat. Serve very hot.

Barley Gruel with Beef Extract.—One-half teaspoonful of "Soluble Beef," two cupfuls of hot water, one tablespoonful of barley flour, one saltspoonful of salt. Dissolve the beef in the hot water, and mix the flour and salt together with a little cold water. Pour the boiling stock on the flour and cook for ten minutes. Strain and serve very hot.

Beef Broth with Poached Eggs.—Prepare the broth in the proportion of half a teaspoonful of "Soluble Beef" to one cupful of hot water and add a poached egg.

A Nutritive Drink for Delicate Women and Children.—This is made by mixing one-fourth to one-half teaspoonful of "Soluble Beef," five ounces of boiling water, and one-half ounce of cream; season with salt and pepper to suit the taste.

Beef Broth with Grain.—Take one teaspoonful of "Soluble Beef," one quart of water, one tablespoonful of rice, and salt to taste. Dissolve the "Soluble Beef" in the hot water, and add the well-washed rice. Simmer slowly until dissolved and absorbed by the rice, adding more beef broth if too much boils away. If not entirely dissolved, the broth should be strained before using.

Beef-tea Egg-nog.—This requires one-eighth teaspoonful of "Soluble Beef," one-half cupful of hot water, one tablespoonful of brandy, and a pinch of salt. Beat the egg slightly, and add the salt and sugar. Dissolve the "Soluble Beef" in the hot water, add to the egg, and strain. Mix thoroughly, adding wine, and serve.

MEAT JELLIES WITHOUT GELATIN

Chicken Jelly.—Half a grown chicken should be well pounded, and boiled in one quart of water for two hours until only a pint remains; season and strain. Serve hot or place on ice, where it will "jell."

Veal-bone Jelly.—Place ten pounds of veal bones and ten quarts of water or weak bouillon over the fire and bring to just a boil. Skim and add two pounds of barley and a little salt. Simmer for five or six hours and then strain. If too thick, dilute, before serving, with bouillon. Stir in the yolk of an egg in a cup and serve.

Meat Jelly.—This is made by cooking good boneless, lean beef in a water bath with a little water for sixteen hours or until it becomes gelatinized. Of the artificial preparations on the market for making bouillon, the most reliable is Liebig's Extract of Meat (10:250 gm.) or Cibil's Bouillon (1 teaspoonful to 250 gm.). Inaglio's bouillon capsules are also very convenient. If it is desired to make the bouillon more nutritious, one teaspoonful of meat peptone may be added.—(*Hepp.*)

Jelly for Dyspeptics.—Remove the skin and meat from one calf's foot; wash the bones and place in cold water on the stove; when it begins to foam, skim off the refuse which gathers on top. After rinsing off the scum with cold water, put the bones into a pot with one-quarter kilo of beef or half an old hen, one-quarter liter of water, and 5 gm. of salt, and boil slowly for from four to five hours. Pour the jelly thus formed through a fine sieve, and place overnight in a cellar. Next morning remove the fat, and clarify the cold jelly by adding one egg with its shell mashed, beating and stirring steadily. Then, with the addition of a little cornstarch, subject the whole to a temperature not over 60° R., or the white of the egg will curdle. Constantly beat and stir. If the jelly begins to get grainy, cover and let it cool until the white of the egg becomes flaky and separates. Then strain again several times until it becomes perfectly clear; add 5 gm. of extract of meat, pour the jelly into a mold, and let it cool again. The gravy from a roast may be utilized and is very palatable. It must be stirred in while the mass is still warm and liquid. This jelly is usually relished with cold fowl, but spoils easily in summer; it must therefore be kept on ice.—(*Weil*)

Dishes Made with Gelatin.—Gelatin should be soaked in cold water for about half an hour to soften it. It may then be easily dissolved by adding boiling water. If it is desired to soften gelatin quickly, it should be placed in cold water and gradually heated over boiling water until it dissolves. If a jelly is to be strained, a wet cloth should be used for the purpose. Jelly molds should be wet with cold water before being filled. When granulated gelatin is used, much smaller amounts are required than when the ordinary form is used.

Wine Jelly.—Soak a teaspoonful of granulated gelatin in two tablespoonfuls of cold water and half a cupful of hot water. Add two tablespoonfuls of sugar and half a teaspoonful of lemon juice, and when cooling add two tablespoonfuls of wine.—(*Drexel Institute.*)

Lemon Jelly is made in the same manner as the wine jelly just described, using a tablespoonful of lemon juice in place of the quantity directed.

Orange Jelly is made in a similar manner, using two teaspoonfuls of lemon juice, four tablespoonfuls of orange juice, and three tablespoonfuls of sugar, but a little less of the boiling water.

Coffee Jelly is also made similarly, adding an ounce or two of coffee.

Nutritious Coffee.—Dissolve a little isin-glass or gelatin in water, put half an ounce of freshly ground coffee into a sauce pan with one pint of new milk, which should be nearly boiling before the coffee is added; boil together for three minutes; clear it by pouring some of it into a cup and dashing it back again; add the gelatin, and leave it to settle in a warm place for a few minutes. Beat up an egg in a break-

fast cup, and pour the coffee upon it; if preferred drink without the egg.—(*Thomas.*)

Milk Jelly.—Take two quarts of milk and add half a pound of sugar. Boil for five or ten minutes. Cool, and add an ounce of gelatin dissolved in a cupful of cold water. Flavor with the juice of two or three lemons and three glasses of good Bordeaux wine.—(*Schlesinger.*)

Irish-moss Blanc-mange.—Wash a tablespoonful of Irish moss in several changes of water and pick it over carefully. Place it in a double boiler together with half a cupful of milk. Cook until it thickens when dropped on a cold plate. Add salt, strain, and flavor. Pour into a custard cup that has first been rinsed in cold water.—(*Drexel Institute.*)

Meat Jellies with Gelatin.—Use any kind of meat broth desired, but always one with appetizing flavor. Add a teaspoonful of granulated gelatin to enough broth to cover it, and allow the gelatin to soak for a few minutes. Then add the remainder of a cupful of the broth very hot and stir until the gelatin is dissolved. Strain, and pour into molds to cool.

Meat Jellies with Tapioca.—Mix a cupful of broth as above with four level tablespoonfuls of powdered tapioca. Heat until quite clear, stirring constantly. Add salt and season as desired. Pour into molds and cool.

Meat Jellies with Irish Moss.—Wash two tablespoonfuls of Irish moss thoroughly. Add this to a cupful of hot broth and allow it to stand for half an hour; then heat slowly, stirring constantly, and boil for ten minutes, preferably in a double boiler. Strain, and pour into molds and cool.

Albuminized Jelly.—Any of the above meat jellies may be rendered more nutritious by the addition of the white of an egg. The egg should be well beaten and stirred into the jelly just after it has been taken off the fire.

RECIPES FOR FOODS FOR DIABETICS

Gluten Pudding.—A batter of egg, cream, and gluten flour is prepared. This is flavored with lemon or other essences and baked.

Gluten Pancakes.—Add gluten flour to one or two eggs and beat into a batter. The pancakes may be sweetened with a little saccharin or eaten with glycerin.—(*Williamson.*)

Jeffries' Gluten Biscuit.—Mix thoroughly gluten flour, one cupful; best bran, previously scalded, one cupful; baking-powder, one teaspoonful; salt to taste; two eggs; milk or water, one cupful.

Diabetic Muffins.—The Equivalent of an egg. These are useful because they have about the same amount of protein and fat as an egg and can be allowed in place of an egg in the diet.

	Protein.	Fat.
Hepco flour, 140 grams	60	1
Eggs (2)	12	12
Cream, 40 per cent., 60 c.cm.	2	24
Butter, 45 grams	..	37
	74	74

Make twelve cakes. Each cake contains 6 grams protein, 6 grams fat, and approximately 75 calories. (Joslin.)

Recipe for Lyster muffins so arranged that each is equivalent to one egg:

	Protein.	Fat.
Lyster flour, 1 box, 105 grams	88	4
Eggs (2)	12	12
Cream, 40 per cent., 90 c.cm.	3	36
Butter, 60 grams	..	50
	103	102

Make seventeen muffins. Each muffin contains 6 grams protein and 6 grams fat. (Joslin.)

Lyster Griddle Cakes.—Use same proportions as for muffins, except to thin batter with a little milk, and fry with butter.

Lyster Waffles.—Make same as griddle cakes and use waffle iron.

Potato Flour Cakes.—1 egg, 2 tablespoonfuls melted butter, 1 tablespoonful cream, 3 tablespoonfuls potato flour, thin batter with milk and fry in butter like Lyster griddle cakes.

Thin Cakes.—2 cups corn or oatmeal, 2 cups boiling water, 1 tablespoonful butter, salt. Mix quickly, stirring hard. Spread thin while hot on buttered tin sheets and bake. Cut in squares before it cools.

Diabetic Bread.—Take one quart of set milk or milk and water, one heaping teaspoonful of good butter, one-fifth of a cake of compressed yeast beaten up with a little water, and two well-beaten eggs. Stir in gluten flour until a soft dough is formed; knead as in making ordinary bread; place in pans to raise, and when light bake in a hot oven.—(*James Stewart.*)

Camplin's Bran Cakes.—Take a sufficient quantity—say a quart—of wheat bran, boil it in two successive waters for a quarter of an hour, each time straining it through a sieve; then wash it well with cold water (on the sieve) until the water runs off perfectly clear; squeeze the bran through a cloth as dry as possible, and then spread it thinly on a dish; place it in a slow oven; if put in at night, let it remain until the morning, when, if perfectly dry and crisp, it will be ready for grinding. The bran thus prepared must be ground in a mill, and sifted through a wire sieve that has so fine a mesh that a brush must be used to pass it through; that which remains in the sieve must be reground until it becomes quite soft and fine. Take of this bran powder three ounces (some patients use four ounces); the other ingredients are as follows: three new-laid eggs; one and one-half or, if desired, two ounces of butter; about half a pint of

milk. Mix the eggs with a little of the milk, and warm the butter with the remainder; then stir the whole well together, adding a little nutmeg or ginger or any other agreeable spice. Bake in small tins (patty pans), which must be well buttered, in a somewhat quick oven for about half an hour. When baked, the cakes should be a little thicker than a captain's biscuit; they may be eaten with meat or cheese for breakfast, dinner, or supper. At tea they require a somewhat liberal allowance of butter, or they may be eaten with curd or with any soft cheese. It is important that the flour be prepared as directed above. If the cakes do not keep well or if they have not been well prepared, place them before the fire for ten minutes every day.

Almond Pudding.—Take two eggs, one-quarter of a pound of almond flour, one-quarter of a pound of butter, and three tabloids of saccharin dissolved in a tablespoonful of brandy. Warm the butter, beat in the almond flour and the yolks of the eggs, and add the dissolved saccharin. Whip the whites into a stiff froth, and beat all together. Put into dariole molds and bake in a quick oven; serve with a little hot sauce made with dry sherry and saccharin.—(*Mrs. Hart.*)

Almond Biscuit.—To each ounce of almond flour add the whites of two eggs and salt to taste. Whip the whites to a stiff froth, add the almond flour, and beat well together. Put in buttered patty pans and bake in a moderately quick oven for from fifteen to twenty minutes. The whole must be done quickly, and baked as soon as the ingredients are mixed. This biscuit is a useful substitute for bread.—(*Mrs. Hart.*)

Almond Cakes No. 1.—Take one pound of ground almonds, four eggs, two tablespoonfuls of milk, a pinch of salt. Beat up the eggs and stir in the almond flour; place in twelve flat tins and bake in a moderate oven for about fifteen minutes.—(*Saundby.*)

Almond Cakes No. 2.—Break up about one-quarter of a pound of sweet almonds in a stone mortar (or almond flour may be used), put the flour into a linen bag, which should then be immersed for one-quarter of an hour in boiling water, acidulated with a little vinegar to remove the small amount of sugar from the almonds. Mix well with three ounces of butter and two eggs. Then the yolks of three eggs and a little salt are added, and the whole stirred briskly for some time. Beat the whites of three eggs to a fine froth and add to the mixture. The paste is then made into biscuits, smeared with butter, and baked with a gentle fire.—(*Seegen.*)

Aleuronat Bread.—Take about six or seven ounces of ordinary wheat flour and the same quantity of aleuronat powder; five ounces of the best butter; one teaspoonful of salt; three-quarters of an ounce of baking powder. The flour and the aleuronat are mixed in a warm dish, and the melted butter and milk (made lukewarm) are added

gradually, followed by the salt, and finally by the baking-powder (one part of sodium carbonate and two parts of cream of tartar). The dough is well mixed, then molded into two loaves, and baked at a good heat.—(*Ebstein.*)

Aleuronat and Almond Cakes.—Three ounces of aleuronat; three ounces of almond flour; beat up one egg, and add about two teaspoonfuls of cream and a little water. Moisten the aleuronat with a little water containing saccharin and let it stand for a few minutes; then add the almond flour, the egg, the cream, and the water just as required to make a light paste. Spread on a tin. Cut into squares, and bake in a moderate oven for twenty minutes.—(*Williamson.*)

Aleuronat Pancakes.—Take one egg and beat it up in a little water and cream; take two teaspoonfuls of aleuronat powder and half a teaspoonful of baking-powder and a little salt. Mix well, and then add gradually to the egg and cream and beat into a batter; allow it to stand for five minutes. If it is too thick, add a little more cream and water. Fry in an ordinary frying-pan greased with a little lard. At the end of about eight minutes, when the under surface is browned, turn it over and continue to bake for five minutes longer.—(*Williamson.*)

Aleuronat and Suet Pudding.—This is a palatable and cheap dish. To make it take two ounces of aleuronat flour and two ounces of suet, one egg, a pinch of salt, and half a teaspoonful of baking-powder. Sprinkle a little aleuronat flour on a chopping-board and chop the suet on this part of the board. Then mix the remaining aleuronat with the suet in a saucepan. Add the salt and the baking powder. Beat up the egg in about three tablespoonfuls of water to which a little saccharin has been added. Add the egg gradually to this mixture, rubbing the whole mass well into a paste. It may be necessary to add a little more water. Drop into a tin pudding mold smeared with butter or lard, float it in a pan of water, and boil for two hours, taking care that the boiling water does not get into the mold; or, better still, the pudding may be baked in the oven. Its taste is improved by the addition of half an ounce of almonds. A small quantity of red wine may serve as a sauce.—(*Williamson.*)

Cocoanut Pancakes.—Beat up one egg in two tablespoonfuls of milk, or, better, in a little cream and water, and add a pinch of salt. Then add two tablespoonfuls of cocoanut powder (freed from sugar). Allow this to stand for from five to ten minutes. Add a little more cream and water. Mix well until it is a little thicker than ordinary pancake batter. Put a little lard in the frying-pan and heat until the lard is just melted; then drop in half of the mixture. Allow this to remain over a moderate fire for a few minutes—about five—until the under surface is brown; then turn the cake over and heat for another five minutes. The other half of the mixture may be used for the second pancake.—(*Williamson.*)

Cocoanut Cakes.—Mix three tablespoonfuls of cocoanut powder into a paste with a little yeast and water. The mixture should be allowed to remain by the fire or in a warm place for about twenty minutes, or until fermentation occurs and it becomes "puffy." Then add a small quantity of a watery solution of saccharin. Beat up one egg, and add this with two teaspoonfuls of cream and a little water to the cocoanut paste. The whole should be well mixed, dropped into small tins, and baked in an oven for about thirty minutes.—(*Williamson.*)

Cocoanut and Almond Cakes.—To make these, the following ingredients are required: Three-quarters of a pound of the finest cocoanut powder, one-quarter of a pound of ground almonds, six eggs, and half a cupful of milk. Beat up the eggs and stir in the cocoanut and almond flour. Divide into sixteen flat tins, and bake for twenty-five minutes in a moderate oven.—(*Saundby.*)

Cocoanut Pudding.—Take three tablespoonfuls of cocoanut powder, mix with a little water and yeast, and keep for twenty minutes in a warm place, so as to allow the small quantity of sugar present to decompose; add four tablespoonfuls of cream, one egg, a little salt, and half a pint of water sweetened with saccharin. Mix into a paste. Place in a dish greased with butter. Cook like rice pudding, in a slow oven for thirty minutes.—(*Williamson.*)

Light Custard.—Beat up well one egg; make a mixture of cream and water and boil; gradually add the boiled cream and water, while hot, to the egg, stirring with a spoon. Then place the mixture in a pan over the fire, and stir constantly until it becomes thick; then pour into a glass. It is important that the mixture should not be heated too much—*i. e.*, that it be not boiled—as the albumin would be coagulated. Flavor with cinnamon and sweeten with saxin or saccharin if desired.

Cheese Cakes.—Take one pint of milk, half a tablespoonful of rennet, one ounce of butter, two eggs, one tablespoonful of brandy, one-quarter of an ounce of almonds, and a little saccharin. Curdle the milk, and let it stand in a warm place until thoroughly set; tie a piece of muslin over a bowl and pour the milk over the muslin; let it stand until all the whey has been strained off. Beat the curd smooth, and add the butter and egg, well beaten, with the brandy, almonds, and saccharin. When well mixed pour into patty pans and bake for fifteen or twenty minutes.—(*Mrs. Hart.*)

Stewed Lettuce.—A well-grown head of lettuce should be selected. Boil this in plenty of water, taking care not to let it fall to pieces. When nearly done take it out of the water, drain, and place in a stewpan with a little rich brown gravy and allow it to simmer for twenty minutes.

Inulin Biscuit.—Put 50 gm. (1½ oz.) of inulin in a large porcelain basin, place this over a hot-water bath, and with 30 c.c. (1 oz.)

of milk and as much hot water as may be necessary, rub up into a smooth dough, into which the yolks of four eggs and a little salt have been mixed. To this add the whites of the four eggs, having first beaten them to a foam, and working them in carefully. Bake in tin molds smeared with butter. The taste of the biscuit may be improved by adding vanilla or other flavoring extract. Inulin is too expensive to be used by the average patient.

Peanut Flour.—This contains about 25 per cent. of carbohydrates. The peanut kernels should be boiled in water for half an hour to extract a portion of the oil which they contain. They should then be dried, and rolled into fine particles with a rolling-pin. Place the kernels in boiling water acidulated with tartaric acid or vinegar, in order (1) to extract saccharin elements; (2) overcome the taste and odor of the peanut; (3) to prevent emulsification of the remaining oil. When they have been thoroughly boiled in acidulated water, the ground kernels should be subjected to dry heat and then rolled into a fine flour. This flour may be made into a form of porridge with milk; bread and biscuits may also be baked from it; and it may be made into the form of a pancake.—(*Stern.*)

Home-made Substitute for Bread.—Beat up thoroughly six eggs; add a teaspoonful of baking-powder or its chemical equivalent, and one-quarter of a teaspoonful of salt, and beat again. Pour this mixture into hot waffle-irons smeared with butter, and bake in a very hot oven. By way of variety almonds (powdered) may be added. These biscuits may be eaten hot with butter and cheese.

Cracked Cocoa.—The so-called cocoa nibs makes a most useful drink for diabetic patients, according to Joslin. He gives the analysis by Street, as follows:

Moisture	2.83
Protein	14.69
Fat	51.42
Fiber	4.32
Ash	3.88
Starch	7.48
Reducing sugar, as dextrose, direct	none
Reducing sugar, as dextrose, after inversion	0.94

The cocoa is prepared by adding a cupful of the cracked cocoa to a cup of water and boiling all day, adding water from time to time.

Milk for Diabetics.—One part cream, three parts water, and add the white of one egg, previously beaten and strained, to each 30 c.c. (1 ounce) of the mixture. Sweeten with saccharin if desired, and stir well before serving.

Sugar-free Milk for Diabetic Feeding.—Take 1 liter of skim milk, heat to a temperature of 30° C., and add 10 c.c. of glacial acetic acid, diluted with 100 c.c. of water. Mix, and allow the mixture to stand for about fifteen minutes. Collect the separated casein, and let it

drain on very fine muslin, using no pressure. Remove the casein to a mortar, rub into a smooth paste, add ½ liter of distilled water, and strain as before. Repeat this washing of the casein twice. Transfer to a mortar, rub until quite smooth, and add 2½ gm. of potassium hydrate dissolved in 100 c.c. of water (or as much of the potassium hydrate as is necessary to make the product just alkaline to phenolphthalein). Add 100 gm. of ordinary Devonshire clotted cream, 5 gm. of gelatin, previously dissolved, 0.06 gm. (1 gr.) of saccharin, and water, at about 38° C., up to 1 liter. Lastly, strain through fine muslin.—(*Hutchinson.*)

Soups for Diabetics.—Consommé.—Three pounds of beef from the round, one small knuckle of veal, five quarts of cold water, simmer four hours, then add: one pound each of carrots, turnips, and onions cut into dice, one teaspoonful of salt, one-half teaspoonful of sweet marjoram, one-half teaspoonful of thyme, one teaspoonful of peppercorns, one bay leaf, one sprig of parsley. Simmer one hour, strain and cool; when cold, skim off the fat.

Consommé with Brussels Sprouts.—To three pints of hot consommé add two cupfuls of Brussels sprouts which have been soaked in cold water twenty minutes, and boiled in boiling salted water fifteen minutes.

Consommé with Claret.—To one pint of consommé add one pint of claret, one pint of hot water, pour one cupful of consommé over the yolks of three eggs; cook until the spoon is coated; add the beaten egg whites. Mix and serve either hot or cold.

Consommé with Cucumbers.—To three pints of consommé add two sliced cucumbers which have been cooked one-half hour in one cupful of water. For the cucumbers may be substituted: red or white cabbage, cauliflower, asparagus, cooked meats chopped, or Parmesan cheese.

Tomato Soup.—Stew tomatoes with butter, strain, and add an equal quantity of consommé.

Jacobin Cubes.—Beat three eggs in a bowl, add some nutmeg and three teaspoonfuls of water; place the bowl in boiling water until the mixture thickens; cut in cubes and serve in broth.

Spinach Pudding.—Mix with one quart of boiled spinach four yolks, add one-half of an onion, one-half cupful of cream, whites whipped stiff, and one-half cupful of ham cut in cubes. Place the mixture in a well-buttered dish and steam in a "bain Marie."

Russian Dressing.—1 can of tomatoes boiled down until very dry, then put through a fine sieve and add saccharin to sweeten, as desired. If one desires there can be added chopped olives, capers, chopped fresh peppers, then mix equal proportions of mayonnaise dressing.

Hollandaise Sauce.—Juice of one lemon; add 1 cup of water and put in double boiler and allow to come to a boil, then add 1 egg, and one tablespoonful of butter, these last two beaten together as for cake.

Stir in egg and butter, stirring constantly to prevent curdling.

Tomato Jelly Salad.—To one can of stewed and strained tomatoes add one teaspoonful of salt and two-thirds of a box of gelatin soaked and dissolved. Pour into small cups and chill. Serve on lettuce leaves with mayonnaise dressing.

Lemon Jelly (Diabetic)

Food.	Amount.	Protein, grams.	Fat, grams.	Carbohydrate, grams.	Calories.
Lemon juice	30 c.cm.	..	..	3	12
Water	50 c.cm.				
Gelatin	4 grams.	4	..	..	16
Saccharin (to sweeten)					
Cream	30 c.cm.	1	12	1	116
		5	12	4	144

Soften gelatin in part of the cold water. Heat the remaining water and lemon juice and pour over the gelatin. Stir until dissolved. Add saccharin, strain into cups. Serve with cream. (Joslin.)

Ice Cream (Diabetic)

Food.	Amount.	Protein, grams.	Fat, grams.	Carbohydrate, grams.	Calories.
Cream (40 per cent.)	90 c.cm.	3	36	3	348
Water	10 c.cm.				
Egg (1)	50 grams	6	6	..	78
Saccharin (to sweeten)					
Flavoring (to taste)					
		9	42	3	426

Make a soft custard of the egg, 50 c.cm. of the cream, and the water. Whip the remaining 40 c.cm. of the cream and fold into custard. The saccharin may be added to the egg. The flavoring should be added last. (Joslin.)

Bavarian Cream (Diabetic)

Food.	Amount.	Protein, grams.	Fat, grams.	Carbohydrate, grams.	Calories.
Cream (40 per cent.)	90 c.cm.	3	36	3	348
Water	10 c.cm.				
Egg (1)	50 grams	6	6	..	78
Gelatin	2 grams	2	..	..	8
Saccharin (to sweeten)					
Flavoring (to taste)					
		11	42	3	434

Soften the gelatin in cold water, then add to the cream, which has been heated. Stir until dissolved, pour on the beaten egg, cook like soft custard, turn into mold and chill. (Joslin.)

Soy Bean Cookery.[1]—In diabetes the beans may be added to the diet simply to give variety, and they may also be used to great advantage in connection with an otherwise carbohydrate-free diet, particularly in those cases in which the sugar percentage is high, and it is with these cases we have had particular success.

The simplest way to use the beans is to cook them like the ordinary navy bean, preparing either bean soup, boiled beans, or baked beans,

[1] Ruhräh, Medical Record, Sept. 23, 1911.

the flavor usually being rather improved by the addition of a piece of fat salt meat. It is also a good plan to soak the beans for eight or ten hours, stir them up, and remove the rather firm envelope which encloses them, most of which will be found to come to the surface, from which they may be easily skimmed off. The beans may be boiled and reduced to a smooth gruel and used in this way as a gruel, although this is rather a troublesome process; or the beans may be thoroughly boiled and mashed and may be flavored with some other vegetable, particularly stewed tomatoes. The soy bean flour may be utilized in many ways.

Gruels.—A quart of gruel is made by boiling from 1 level tablespoonful to 6 ounces of the soy flour (made by the Cereo Company, Tappan, N. Y.) in 1 quart of water for fifteen minutes, adding water to make up for the loss of evaporation. Salt should be added to taste.

	Protein.	Fat.	Carbohydrates.
1 level tablespoonful to quart	0.35	0.15	0.08
1 ounce 4 (tablespoonfuls) to quart	1.40	0.60	0.30

These gruels do not thicken during cooking, as they contain no starch, and readily settle on standing. This may be overcome by adding 1 to 2 heaping teaspoonsful of barley, oat, or wheat gruel flour before cooking, which will add 0.6 to 1.2 per cent. starch to the gruels, and also slightly increase the percentage of protein.

Broths.—Add 1 to 8 ounces of the flour to 1 quart of beef, mutton, veal, or chicken broth and boil for fifteen minutes, adding water to make up for loss of evaporation; or, boil the same quantity of the soy flour for one hour with 1 quart of water, to which has been added a piece of ham, bacon, or salt pork to give flavor. Each ounce of the flour will add to the broth about 13 grams of protein and 120 calories, or in percentage add 1.4 per cent. protein, 0.60 per cent. fat, and 0.30 per cent. carbohydrates. A broth made with 6 ounces of the soy flour to the quart would be half as rich in protein and fat as steak.

Muffins.—To make muffins from the soy flour, take 1¼ teacupfuls of the soy flour, ¼ teacupful of wheat flour, ½ teaspoonful of salt, 2 eggs, 1 teacupful of sweet milk, 2 rounded teaspoonfuls of baking powder, and 1½ tablespoonfuls of melted but not hot butter. Beat well together, adding the melted butter last, and bake in gem pans in a hot oven. This will make about 12 muffins which will contain about 150 grams of protein, and which will yield about 1800 calories, of which the carbohydrates produce but 280. Inasmuch as the soy flour contains no starch, the addition of some wheat flour in making muffins is required. The mixture of wheat and soy flour in this formula will contain about 36 per cent. protein and 20 per cent. carbohydrates, against 14 per cent. protein and 60 to 70 per cent. carbohydrates in gluten flour. The proportion of protein to car-

bohydrates is eight to ten times as large in the mixed soy and wheat flour as in the gluten flour.

In addition to these methods, the following recipe for muffins has been suggested by Dr. Skinner, of New Haven, Conn.: Soy bean flour, 1½ cupfuls; salt, ½ teaspoonful; baking powder, 2 even teaspoonfuls. Mix well and add 2 tablespoonfuls of cream which has first been thoroughly stirred into a cup of cold water. Add 2 eggs and beat together. Then add 2 tablespoonfuls of melted butter and beat the whole mixture well together. Bake fifteen minutes in a heated gem pan. The above makes 15 muffins.

Another recipe for muffins is to beat up 3 eggs, add 1 cup of milk in which 1 grain of saccharin has been dissolved, and a lump of butter the size of an egg. Enough of the bean flour should be added to make a batter with ½ teaspoonful of baking powder. This should be baked in buttered muffin pans.

Nut-cakes.—These may be made by using the above muffin recipe as a basis and adding chopped nuts, almonds, or any other kind desired; and the flour is improved by the addition of a small amount of spice.

Soy Bean Cakes.—These may be made by taking 1 tablespoonful of cocoa, 1 teaspoonful of cinnamon, 1 teaspoonful of allspice, and chopped nuts, adding them to the batter as prepared for the muffins.

Breakfast Food.—As a breakfast food it may be utilized by taking 1 cup of flour, enough milk or water to moisten it into a paste, a pinch of salt, and 1 grain of saccharin, which should be dissolved before adding. Boil one and a half hours in a double boiler and serve with rich cream.

Pancakes.—These may be made by beating up 2 eggs with a pinch of salt, adding enough meal to make a batter, and ¼ teaspoonful of baking powder. This should be fried with butter and made into small cakes.

Soy Bean Cheese.—In China and Japan the bean is used chiefly in the form of a cheese-like substance, the most common forms of this being natto, tofu, miso, yuba, and shoyu. These cheeses are eaten daily by almost all the inhabitants of the East, but they are said to have a lack of flavor that renders them more or less unsuited for European and American palates. In Seattle, Wash., and other places in the West we are informed that tofu is made by the Japanese and sold to the Oriental residents. We have not had any personal experience so far with the bean cheeses, although they are evidently very easy to manufacture. One may be made from the gruel which resembles somewhat curds and whey, but which in the only form we have tried is not sufficiently palatable for use, although very slight flavoring might make it a valuable food for American use.

The following suggestions for cooking the bean are made by Goff:[1]

Grilled Soy Beans.—The beans may be grilled like chestnuts, using the same method. If the beans are old and dry they should be first soaked in warm water.

Soy Beans with Butter.—Let the beans soak in warm water until the hulls are separated and float upon the surface, then let them strain for twenty-four hours, when they should be cooked, according to the age of the grains, from one to four hours, and seasoned to taste. They should then be strained again and served hot with butter on lettuce or romaine.

Soy Beans au Gras.—Place a chopped onion in a casserole of fat and fry it until the onion becomes brown. Then add the soy beans cooked as above, and allow them to cook a few minutes longer.

Bread or Cakes of Soy Beans.—Triturate in a mortar 250 grams of soy flour with 2 fresh eggs and a large spoonful of milk. When this is perfectly mixed, add a pinch of baking powder, place in well-buttered molds, and cook from fifteen to twenty minutes. This may be flavored with vanilla, orange-flowers, or with pieces of citron. They may be divided into small cakes and then cooked in very small molds.

Antiscurvy Lemon Juice Tablets.—The fresh juice is filtered through muslin and then through filter-paper under reduced pressure. The filtered juice is evaporated *in vacuo* over sulphuric acid at ordinary temperature, and the syrupy residue made into as stiff a paste as possible with a mixture of 97 per cent. anhydrous lactose and 3 per cent. gum tragacanth. The paste is cut into sections, each containing the juice of half a lemon. These are then rolled and pressed into the shape of lozenges.

[1] Gazette des Hôpitaux, March 7, 1911, p. 399.

THE CHEMICAL COMPOSITION OF AMERICAN FOOD MATERIALS

THE material in this section has been taken from the revised edition of Bulletin No. 28 of the Experiment Stations of the Department of Agriculture of the United States. This very valuable bulletin was prepared by W. O. Atwater and A. P. Bryant, and represents the best compilation of analyses of American food materials down to 1899. Only the averages have been abstracted from the tables; for ordinary purposes these will be found to be sufficient; for the complete tables the reader should refer to the original bulletin.

The earliest quantitative food analyses were made in 1795 by Pearson, in England, who analyzed potatoes. In 1805 Einhoff analyzed potatoes and rye. Later other workers gave various accounts of their work, but the great impetus to the study of food materials was given by Liebig and his followers, whose work was done chiefly in the period between 1840 and 1865. About 1864 Henneberg and his associates elaborated the so-called Weende method for proximate analysis. This method, with slight alterations, is used to-day wherever food analyses are made. "The methods followed in different countries agree so closely that for the last twenty years it has been possible to accept analyses by chemists in different parts of the world and compare them with one another without hesitation" (Atwater and Bryant). Since the establishment of the experiment stations an enormous amount of work has been done. The results given in the tables show the averages of thousands of analyses; these, together with the accompanying list, have been taken directly from Atwater and Bryant's publication.

EXPLANATION OF TERMS[1]

The terms used in reporting analyses of foods and feeding-stuffs need some explanation. Some of these terms have a technical meaning which is well recognized and understood by scientists, although the dictionaries and similar books of reference have not yet included these uses in their definitions. In other cases the same word has been used by scientists in different ways. The more usual terms are defined and explained below in the sense in which they are employed in the following table and the publications of the Experiment Stations of the United States Department of Agriculture.

[1] These definitions are quoted from Atwater and Bryant.

COMPOSITION OF FOOD MATERIALS

Ordinary food materials, such as meat, fish, eggs, potatoes, wheat, etc., consist of:

Refuse.—As the bones of meat and fish, shells of shellfish, skin of potatoes, bran of wheat, etc.

Edible Portion.—As the flesh of meat and fish, the white and yolk of eggs, wheat flour, etc. This edible portion consists of water (usually incorporated in the tissue and not visible as such), and nutritive ingredients or nutrients.

The principal kinds of nutritive ingredients are protein, fats, carbohydrates, and ash or mineral matters.

The water and refuse of various foods and the salt of salted meat and fish are called non-nutrients. In comparing the values of different food materials for nourishment they are left out of account.

Protein.—This term is used to include nominally the total nitrogenous substance of animal and vegetable food materials, exclusive of the so-called nitrogenous fats. Actually it is employed, in common usage, to designate the product of the total nitrogen by an empirical factor, generally 6.25.

This total nitrogenous substance consists of a great variety of chemical compounds, which are conveniently divided into two principal classes, proteids and non-proteids.

The term proteid, as here employed, includes: (1) The simple proteids, *e. g.*, albuminoids, globulins, and their derivatives, such as acid and alkali albumins, coagulated proteids, proteoses, and peptones; (2) the so-called combined or compound proteids; and (3) the so-called gelatinoids (sometimes called "glutinoids") which are characteristic of animal connective tissue.

The term albuminoids has long been used by European and American chemists and physiologists as a collective designation for the substances of the first two groups, though many apply it to all three of these groups. Of late a number of investigators and writers have employed it as a special designation for compounds of the third class.[1]

The term non-proteid is here used synonymously with non-albuminoid, and includes nitrogenous animal and vegetable compounds of simpler constitution than the proteids. The most important animal compounds of this class are the so-called "nitrogenous extractives" of muscular and connective tissue, such as creatin, creatinin, xanthin, hypoxanthin, and allied cleavage products of the proteids. To some of these the term "meat bases" has been applied. The latter, with certain mineral salts (potassium phosphates, etc.), are the most important constituents of beef-tea and many commercial "meat extracts."

[1] United States Department of Agriculture, Office of Experiment Stations, Bulletin 65, p. 118.

The non-proteid nitrogenous compounds in vegetable foods consist of amids and amido acids, of which asparagin and aspartic acid are familiar examples.

The ideal method of analysis of food materials would involve quantitative determinations of the amounts of each of the several kinds or groups of nitrogenous compounds. This, however, is seldom attempted. The common practice is to multiply the percentage of nitrogen by the factor 6.25 and take the product as representing the total nitrogenous substance. For many materials, animal and vegetable, this factor would be nearly correct for the proteids, which contain, on the average, not far from 16 per cent. of nitrogen, although the nitrogen content of the individual proteids is quite varied. The variations in the nitrogen of the non-proteids are wider, and they contain, on the average, more than 16 per cent. of nitrogen. It is evident, therefore, that the computation of the total nitrogenous substance in this way is by no means correct. In the flesh of meats and fish, which contain very little of carbohydrates, the nitrogenous substance is frequently estimated by difference—*i. e.*, by subtracting the ether extract and ash from the total water-free substance. While this method is not always correct, it is oftentimes more nearly so than the determination by use of the usual factor.

The distinction between protein and proteids is thus very sharp. The latter are definite chemical compounds, while the former is an entirely arbitrary term used to designate a group which is commonly assumed to include all of the nitrogenous matter of the food except the nitrogenous fats.

In the tables herewith the common usage is followed, by which the protein is given as estimated by factor—*i. e.*, total nitrogen multiplied by 6.25. In the analyses of meats and fish, however, the figures for protein ''by difference'' are also given. Where the proteid and non-proteid nitrogenous matter have been estimated in a food material the proportions are indicated in a footnote.

Fats.—Under fats is included the total ether extract. Familiar examples of fat are fat of meat, fat of milk (butter), oil of corn, olive oil, etc. The ingredients of the ''ether extract'' of animal and vegetable foods and feeding-stuffs, which it is customary to group roughly as fats, include with the true fats various other substances, as fatty acids, lecithins (nitrogenous fats), and chlorophylls.

Carbohydrates.—Carbohydrates are usually determined by difference. They include sugars, starches, cellulose, gums, woody fiber, etc. In many instances separate determinations of one or more of these groups have been made. The determinations of ''fiber'' in vegetable foods—*i. e.*, substances allied to carbohydrates but insoluble in dilute acid and alkali, and somewhat similar to woody fiber—are given in a separate column.

The figures in parentheses in the crude-fiber column show the num-

ber of analyses in which the fiber was determined. The figures for "total carbohydrates" include the fiber, as well as sugars, starches, etc. Where the sugars or starches have been determined separately, footnotes are added giving the average results.

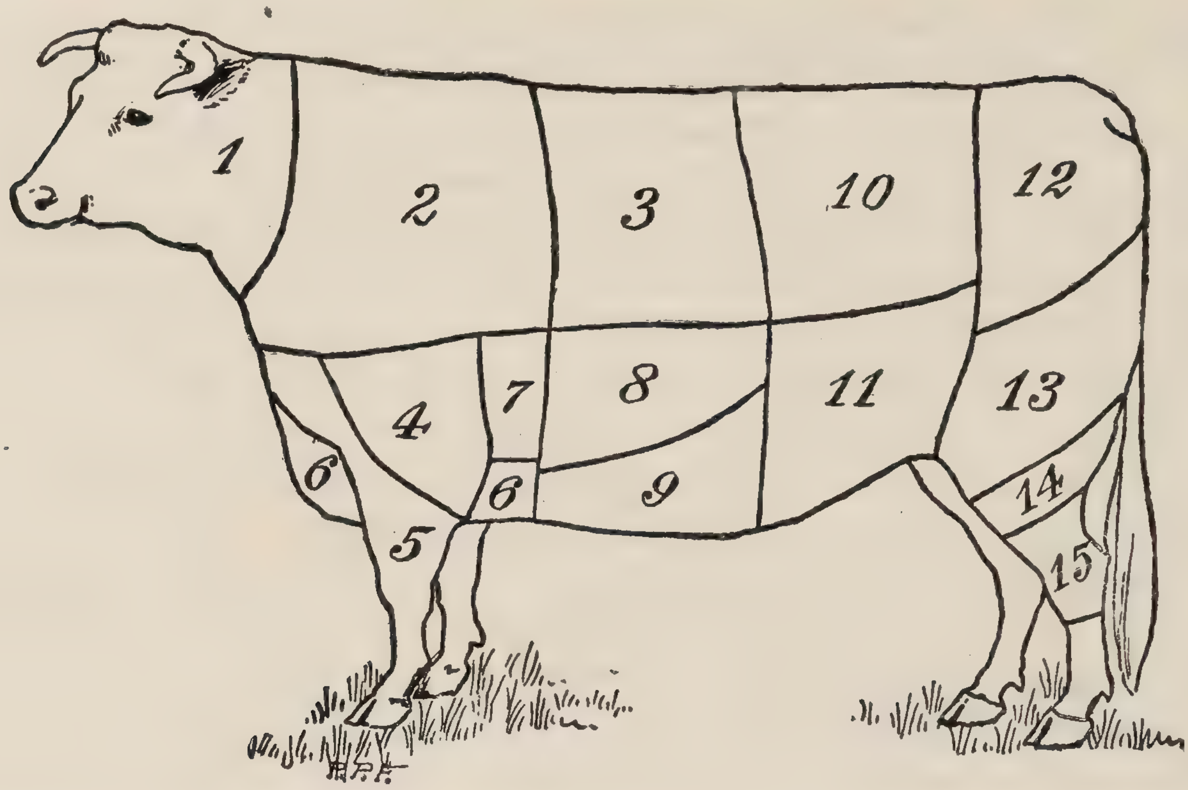
Ash or Mineral Matters.—Under this head are included phosphates, sulphates, chlorids, and other salts of potassium, sodium, magnesium, and other metallic elements. Where analyses of the mineral matters have been found they are added in the form of footnotes. These results usually give the percentage composition of the ash as produced by incineration rather than the proportions in which the different mineral ingredients occur in the food material.

Fuel-value.—By fuel-value is meant the number of calories of heat equivalent to the energy which it is assumed the body would be able to obtain from one pound of a given food material, provided the nutrients of the latter were completely digested. The fuel values of the different food materials are calculated by use of the factors of Rubner, which allow 4.1 calories for a gram of protein, the same for a gram of carbohydrates, and 9.3 calories per gram of fats. These amounts correspond to 18.6 calories of energy for each hundredth of a pound of protein and of carbohydrates, and 42.2 calories for each hundredth of a pound of fat in the given food material. In the following tables the fuel-value per pound has been calculated by use of these factors. In these calculations the values of protein by factor have been used in all cases with the exception of salt cod and hen's eggs, in which the value of protein by difference was used.

CUTS OF MEAT

The methods of cutting sides of beef, veal, mutton, and pork into parts, and the terms used for the different "cuts," as these parts are commonly called, vary in different localities. The analyses here reported apply to cuts as indicated by the following diagrams. These show the positions of the different cuts, both in the live animal and in the dressed carcass as found in the markets. The lines of division between the different cuts will vary slightly, according to the usage of the local market, even where the general method of cutting is as here indicated. The names of the same cuts likewise vary in different parts of the country.

The Cuts of Beef.—The general method of cutting up a side of beef is illustrated in Fig 11, which shows the relative position of the cuts in the animal and in a dressed side. The neck piece is frequently cut so as to include more of the chuck than is represented by the diagrams. The shoulder clod is usually cut without bone, while the shoulder (not indicated in diagram) would include more or less of the shoulder-blade and of the upper end of the fore shank. Shoulder steak is cut from the chuck. In many localities the plate is made to include all



the parts of the fore-quarter designated on the diagrams as brisket, cross-ribs, plate and navel, and different portions of the plate, as thus cut, are spoken of as the "brisket end of plate" and "navel end of plate." This part of the animal is largely used for corning. The ribs are frequently divided into first, second, and third cuts, the latter lying nearest the chuck and being slightly less desirable than the former. The chuck is sometimes subdivided in a similar manner, the third cut of the chuck being nearest the neck. The names applied to different portions of the loin vary considerably in different localities. The part nearest the ribs is frequently called "small end of loin" or "short steak." The other end of the loin is called "hip sirloin" or "sirloin." Between the short and the sirloin is a portion quite generally called the "tenderloin," for the reason that the real tenderloin, the very tender strip of meat lying inside the loin, is found most fully developed in this cut. Porterhouse steak is a term most frequently applied to either the short steak or the tenderloin. It is not uncommon to find the flank cut so as to include more of the loin

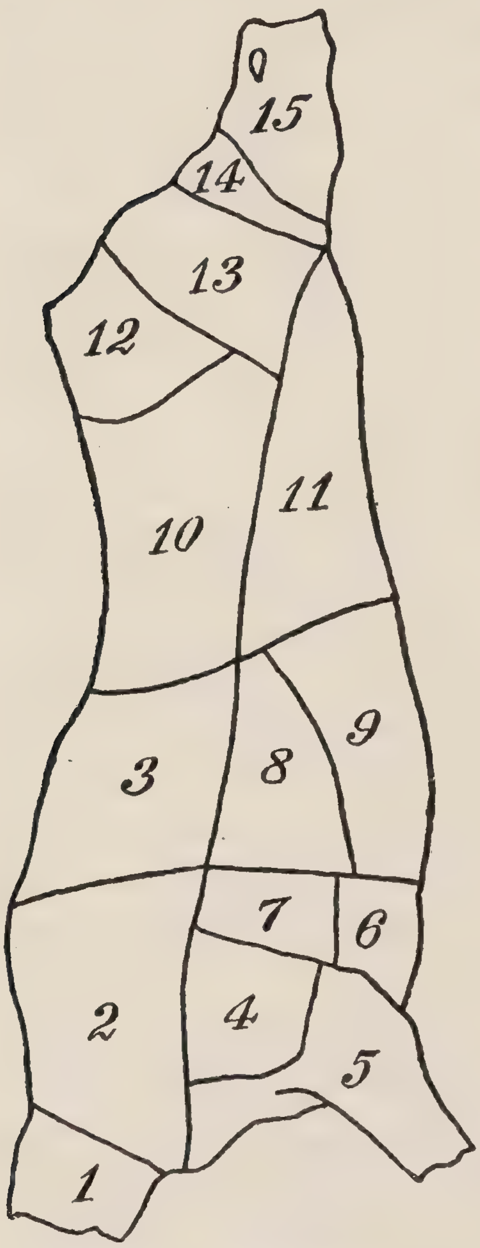
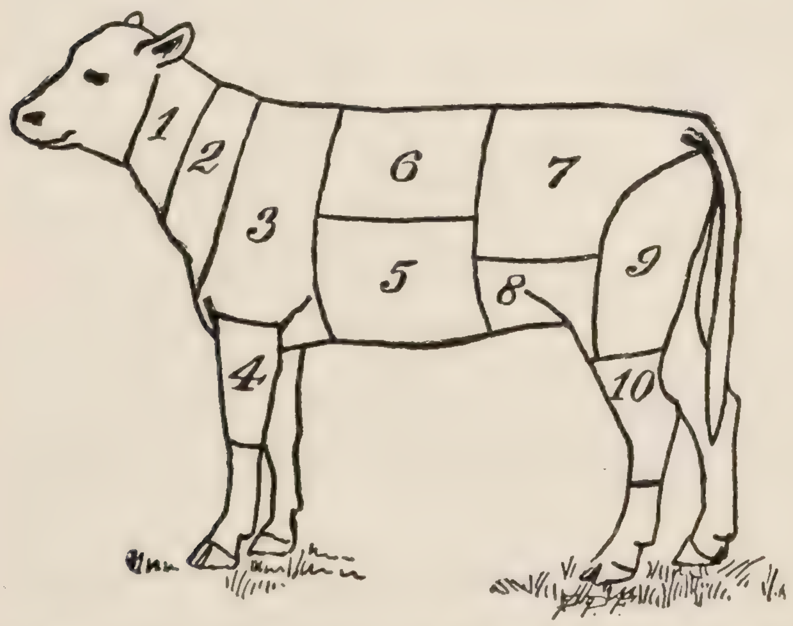


Fig. 11.—Diagrams of cuts of beef: 1, Neck; 2, chuck; 3, ribs; 4, shoulder-clod; 5, fore-shank; 6, brisket; 7, cross-ribs; 8, plate; 9, navel; 10, loin; 11, flank; 12, rump; 13, round; 14, second-cut round; 15, hind-shank.—(Atwater and Bryant, Bulletin No. 28, Office of Experiment Stations, United States Department of Agriculture.)

than is indicated in the figures, in which case the upper portion is called "flank steak." The larger part of the flank is, however, very frequently corned, as is also the case with the rump. In some markets the rump is cut so as to include a portion of the loin, which is then sold as "rump steak." The portion of the round on the inside of the leg is regarded as more tender than that on the outside, and is frequently preferred to the latter. As the leg lies upon the butcher's table this inside of the round is usually on the upper or top side, and is therefore called "top round." Occasionally the plate is called the "rattle."

The Cuts of Veal.—The method of cutting up a side of veal differs considerably from that employed with beef. This is illustrated by Fig. 12, which shows the relative position of the cuts in the animal and in a dressed side. The chuck is much smaller in proportion, and frequently no distinction is made between the chuck and the neck. The chuck is often cut so as to include considerable of the portion here designated as shoulder, following more nearly the method adopted for subdividing beef. The shoulder of veal as here indicated includes, besides the portion corresponding to the shoulder in beef, the larger part of what is here classed as chuck in the adult animal. The under part of fore-quarter, corresponding to the plate in the beef, is



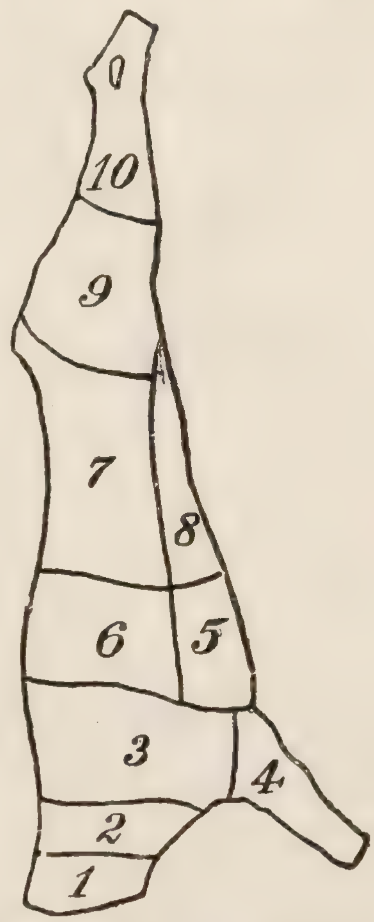


Fig. 12.—Diagrams of cuts of veal: 1, Neck; 2, chuck; 3, shoulder; 4, fore-shank; 5, breast; 6, ribs; 7, loin; 8, flank; 9, leg; 10, hind-shank.—(Atwater and Bryant, Bulletin No. 28, Office of Experiment Stations, United States Department of Agriculture.)

often designated as breast in the veal. The part of the veal corresponding to the rump of beef is here included with the loin, but is often cut to form part of the leg. In many localities the fore- and hind-shanks of veal are called the "knuckles."

The Cuts of Lamb and Mutton.—Fig. 13 shows the relative position of the cuts in a dressed side of mutton or lamb and in a live animal.

The cuts in a side of lamb and mutton number but six, three in each quarter. The chuck includes the ribs as far as the end of the shoulder-blades, beyond which comes the loin. The flank is made to include all the under side of the animal. Some butchers, however, make a larger number of cuts in the fore-quarter, including a portion of the cuts marked ''loin'' and ''chuck'' in Fig. 13, to make a cut designated as ''rib,'' and a portion of the ''flank'' and ''shoulder'' to make a cut designated as ''brisket.'' The term ''chops'' is ordinarily used to designate portions of either the loin, ribs, chuck or shoulder,

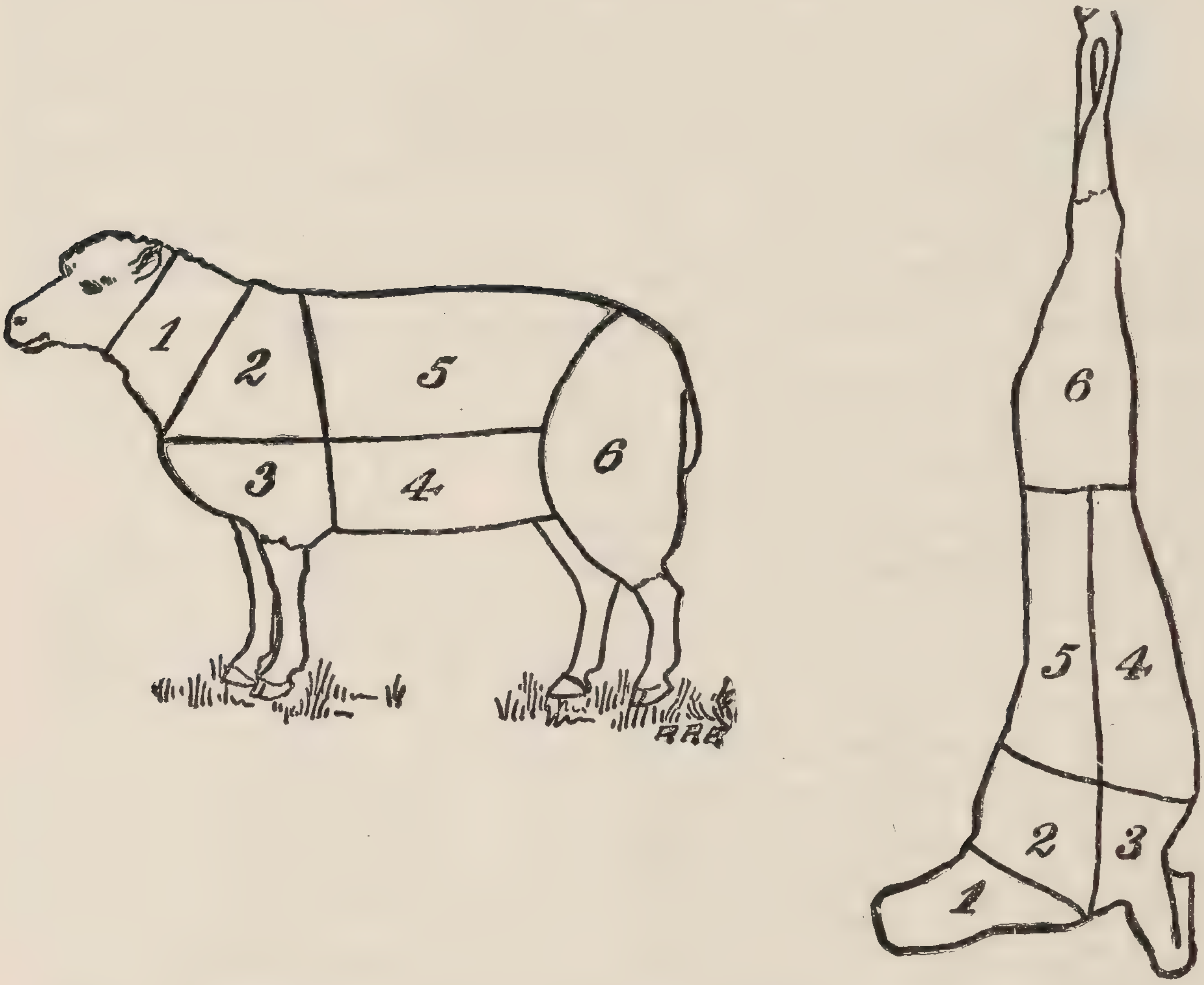


Fig. 13.—Diagrams of cuts of lamb and mutton: 1, Neck; 2, chuck; 3, shoulder; 4, flank; 5, loin; 6, leg.—(Atwater and Bryant, Bulletin No. 28, Office of Experiment Stations, United States Department of Agriculture.)

which are either cut or ''chopped'' by the butcher into pieces suitable for frying or boiling. The chuck and ribs are sometimes called the ''rack.''

The Cuts of Pork.—The method of cutting up a side of pork differs considerably from that employed with other meats. A large portion of the carcass of a dressed pig consists of almost clear fat. This furnishes the cuts which are used for ''salt pork'' and bacon. Fig. 14 illustrates a common method of cutting up pork, showing the relative position of the cuts in the animal and in the dressed side. The cut designated as ''back cut'' is almost clear fat, and is used for salting and pickling. The ''middle cut'' is the portion quite generally used

for bacon and for "lean ends" salt pork. The belly is salted or pickled or may be made into sausages.

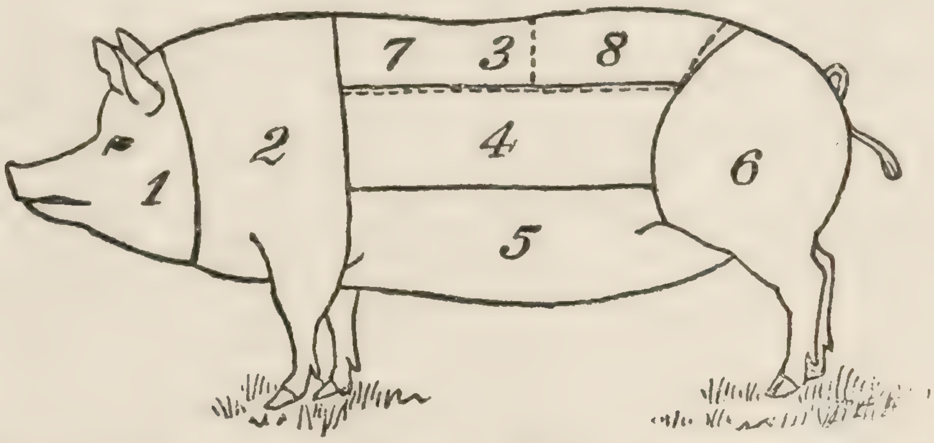
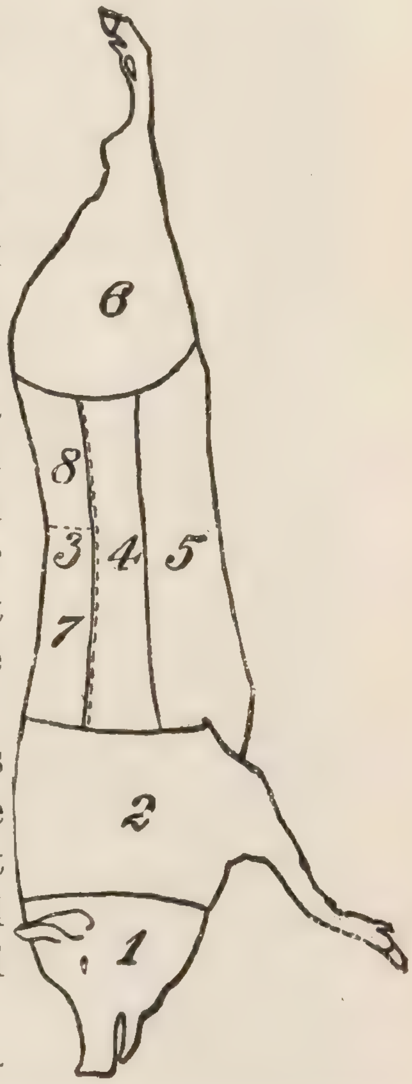


Fig. 14.—Diagrams of cuts of pork: 1, Head; 2, shoulder; 3, back; 4, middle cut; 5, belly; 6, ham; 7, ribs; 8, loin.—(Atwater and Bryant, Bulletin No. 28, Office of Experiment Stations, United States Department of Agriculture.)



Beneath the "back cut" are the ribs and loin, from which are obtained the "spareribs," "chops," and roasting pieces, here designated by dotted lines. The hams and shoulders are more frequently cured, but are also sold as fresh pork "steak." The tenderloin proper is a comparatively lean and very small strip of meat lying under the bones of the loin and usually weighing a fraction of a pound. Some fat is usually trimmed off from the hams and shoulders, which is called "ham and shoulder fat," and is often used for sausages, etc. What is called "leaf lard," at least in some localities, comes from the inside of the back. It is the kidney fat.

As stated above cuts as shown in the diagrams herewith correspond to those of which analyses are reported in the tables beyond, but do not attempt to show the different methods of cutting followed in markets in different parts of the United States.

Note.—Dividing the calories per pound by 4.5 will give the approximate number of calories per 100 grams. See also additional tables in front of book.

THE CHEMICAL COMPOSITION OF AMERICAN FOOD MATERIALS

(*The figures given are the averages in each instance.*)

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD.									
BEEF, FRESH.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Brisket, medium fat—									
Edible portion	3	. .	54.6	15.8	16.0	28.5	. .	0.9	1495
As purchased	3	23.3	41.6	12.0	12.2	22.3	. .	0.6	1165
Chuck, including shoulder, lean—									
Edible portion	2	. .	71.3	20.2	19.5	8.2	. .	1.0	720
As purchased	2	19.5	57.4	16.3	15.7	6.6	. .	0.8	580
Chuck, including shoulder, medium fat—									
Edible portion	4	. .	68.3	19.6	18.9	11.9	. .	0.9	865
As purchased	4	15.2	57.9	16.6	16.0	10.1	. .	0.8	735
Chuck, including shoulder, fat—									
Edible portion	4	. .	62.3	18.5	18.0	18.8	. .	0.9	1135
As purchased	3	14.7	53.3	15.9	15.4	15.9	. .	0.7	965
Chuck, including shoulder, very fat—									
Edible portion	2	. .	53.2	17.2	16.9	29.0	. .	0.9	1555
As purchased	2	22.8	40.8	13.3	13.0	22.7	. .	0.7	1205
Chuck rib, lean—									
Edible portion	11	. .	71.3	19.5	19.4	8.3	. .	1.0	715
As purchased	11	22.7	55.1	15.1	15.0	6.4	. .	0.8	550
Chuck rib, medium fat—									
Edible portion	7	. .	62.7	18.5	18.3	18.0	. .	1.0	1105
As purchased	7	16.3	52.6	15.5	15.3	15.0	. .	0.8	920
Chuck rib, fat—									
Edible portion	2	. .	52.0	16.5	16.1	31.1	. .	0.8	1620
As purchased	2	10.2	46.8	14.8	14.4	27.9	. .	0.7	1455
Flank, very lean—									
Edible portion	3	. .	70.7	25.9	24.8	3.3	. .	1.2	620
As purchased	3	3.5	68.2	24.9	23.9	3.3	. .	1.1	605
Flank, lean—									
Edible portion	3	. .	67.8	20.8	19.9	11.3	. .	1.0	865
As purchased	3	1.4	66.9	20.5	19.7	11.0	. .	1.0	845
Flank, medium fat—									
Edible portion	5	. .	60.2	18.9	17.9	21.0	. .	0.9	1240
As purchased	5	10.2	54.0	17.0	16.1	19.0	. .	0.7	1115
Flank, fat—									
Edible portion	3	. .	54.2	17.1	16.6	28.4	. .	0.8	1515
As purchased	3	3.3	52.4	16.5	16.2	27.3	. .	0.8	1460
Flank, very fat—									
Edible portion	2	. .	34.7	14.0	12.8	51.8	. .	0.7	2445
As purchased	2	6.0	33.0	13.2	12.0	48.3	. .	0.7	2275
Loin, very lean—									
Edible portion	3	.	70.8	24.6	24.2	3.7	. .	1.3	615
As purchased	3	23.0	54.6	18.8	18.5	3.0	. .	0.9	475
Loin, lean—									
Edible portion	12	. .	67.0	19.7	19.3	12.7	. .	1.0	900
As purchased	11	13.1	58.2	17.1	16.7	11.1	. .	0.9	785
Loin, medium fat—									
Edible portion	32	. .	60.6	18.5	18.2	20.2	. .	1.0	1190
As purchased	32	13.3	52.5	16.1	15.8	17.5	. .	0.9	1040

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*)									
BEEF, FRESH (*Continued*).									
Loin, fat—		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Edible portion	6	. .	54.7	17.5	16.8	27.6	. .	0.9	1490
As purchased	6	10.2	49.2	15.7	15.0	24.8	. .	0.8	1305
Loin, very fat—									
Edible portion	3	. .	49.7	17.8	17.1	32.3	. .	0.9	1695
As purchased	3	9.7	44.9	16.0	15.5	29.1	. .	0.8	1525
Loin, boneless strip, as purchased[1]	6	. .	66.3	17.8	16.2	16.7	. .	0.8	1035
Loin, sirloin butt, as purch'd[1]	6	. .	62.5	19.7	18.9	17.7	. .	0.9	1115
Loin, tenderloin, as purchased[1]	6	. .	59.2	16.2	15.6	24.4	. .	0.8	1330
Neck, very lean—									
Edible portion	3	. .	73.2	22.5	22.5	3.2	. .	1.1	555
As purchased	3	44.3	40.7	12.5	12.2	2.2	. .	0.6	325
Neck, lean—									
Edible portion	2	. .	70.1	21.4	20.5	8.4	. .	1.0	750
As purchased	2	29.5	49.5	15.1	14.4	5.9	. .	0.7	530
Neck, medium fat—									
Edible portion	10	. .	63.4	20.1	19.2	16.5	. .	0.9	1070
As purchased	10	27.6	45.9	14.5	13.9	11.9	. .	0.7	770
Plate, very lean—									
Edible portion	3	. .	69.1	22.8	22.1	7.7	. .	1.1	750
As purchased	3	37.4	43.0	13.6	13.2	5.7	. .	0.7	495
Plate, lean—									
Edible portion	3	. .	65.9	15.6	14.6	18.8	. .	0.7	1085
As purchased	3	17.3	54.4	13.0	12.2	15.5	. .	0.6	895
Plate, medium fat—									
Edible portion	7	. .	54.4	16.5	15.7	29.1	. .	0.8	1535
As purchased	7	16.5	45.3	13.8	13.1	24.4	. .	0.4	1285
Plate, fat—									
Edible portion	3	. .	45.2	14.6	14.2	39.8	. .	0.8	1950
As purchased	3	16.0	38.0	12.2	11.9	33.5	. .	0.6	1640
Ribs, very lean—									
Edible portion	4	. .	70.9	25.0	24.4	3.5	. .	1.2	615
As purchased	4	23.3	54.2	19.4	18.9	2.7	. .	0.9	475
Ribs, lean—									
Edible portion	6	. .	67.9	19.6	19.1	12.0	. .	1.0	870
As purchased	6	22.6	52.6	15.2	14.8	9.3	. .	0.7	675
Ribs, medium fat—									
Edible portion	15	. .	55.5	17.5	17.0	26.6	. .	0.9	1450
As purchased	15	20.8	43.8	13.9	13.5	21.2	. .	0.7	1155
Ribs, fat—									
Edible portion	9	. .	48.5	15.0	15.2	35.6	. .	0.7	1780
As purchased	8	16.8	39.6	12.7	12.4	30.6	. .	0.6	1525
Rib rolls, very lean, as purchased	2	. .	73.7	20.8	20.3	5.0	. .	1.0	600
Rib rolls, lean, as purchased	3	. .	69.0	20.2	19.5	10.5	. .	1.0	820
Rib rolls, medium fat, as purchased	4	. .	63.9	19.3	18.5	16.7	. .	0.9	1065
Rib rolls, fat, as purchased .	2	. .	51.5	17.2	16.4	31.3	. .	0.8	1640
Rib trimmings, all analyses—									
Edible portion	11	. .	54.7	16.9	16.1	28.4	. .	0.8	1515
As purchased	11	34.1	35.7	11.0	10.5	19.2	. .	0.5	1015
Round, very lean—									
Edible portion	6	. .	73.6	22.6	22.3	2.8	. .	1.3	540
As purchased	6	10.6	65.9	20.2	19.9	2.4	. .	1.2	475
Round, lean—									
Edible portion	31	. .	70.0	21.3	21.0	7.9	. .	1.1	730
As purchased	29	8.1	64.4	19.5	19.2	7.3	. .	1.0	670
Round, medium fat—									
Edible portion	18	. .	65.5	20.3	19.8	13.6	. .	1.1	950
As purchased	14	7.2	60.7	19.0	18.3	12.8	. .	1.0	895
Round, fat—									
Edible portion	5	. .	60.4	19.5	19.1	19.5	. .	1.0	1185
As purchased	3	12.0	54.0	17.5	17.1	16.1	. .	0.8	1005

[1] All loin parts are included under analyses of "loin."

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound
ANIMAL FOOD (*Continued*).									
BEEF, FRESH (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Round, very fat—									
Edible portion	2	. .	55.9	18.2	17.1	26.2	. .	0.8	1445
As purchased	2	11.4	49.6	16.1	15.2	23.1	. .	0.7	1275
Round, second cut—									
Edible portion	2	. .	69.8	20.4	20.5	8.6	. .	1.1	740
As purchased	2	19.5	56.2	16.4	16.5	6.9	. .	0.9	595
Rump, very lean—									
Edible portion	4	. .	71.2	23.0	22.5	5.1	. .	1.2	645
As purchased	4	14.3	60.9	19.5	19.1	4.6	. .	1.1	555
Rump, lean—									
Edible portion	4	. .	65.7	20.9	19.6	13.7	. .	1.0	965
As purchased	3	14.0	56.6	19.1	17.5	11.0	. .	0.9	820
Rump, medium fat—									
Edible portion	10	. .	56.7	17.4	16.9	25.5	. .	0.9	1400
As purchased	10	20.7	45.0	13.8	13.4	20.2	. .	0.7	1110
Rump, fat—									
Edible portion	5	. .	47.1	16.8	16.4	35.7	. .	0.8	1820
As purchased	5	23.0	36.2	12.9	12.6	27.6	. .	0.6	1405
Shank, fore, very lean—									
Edible portion	4	. .	74.4	22.1	21.7	2.8	. .	1.1	530
As purchased	4	44.1	41.6	12.3	12.1	1.6	. .	0.6	295
Shank, fore, lean—									
Edible portion	5	. .	71.5	22.0	21.4	6.1	. .	1.0	665
As purchased	5	36.5	45.4	14.6	13.6	3.9	. .	0.6	425
Shank, fore, medium fat—									
Edible portion	5	. .	67.9	20.4	19.6	11.6	. .	0.9	870
As purchased	5	36.9	42.9	12.8	12.3	7.3	. .	0.6	545
Shank, hind, lean—									
Edible portion	6	.	72.5	21.9	21.1	5.4	. .	1.0	635
As purchased	6	58.5	30.1	9.1	8.8	2.2	. .	0.4	260
Shank, hind, medium fat—									
Edible portion	6	. .	67.8	20.9	19.8	11.5	. .	0.9	875
As purchased	6	53.9	31.3	9.6	9.1	5.3	. .	0.4	405
Shoulder and clod, very lean—[1]									
Edible portion	4	. .	76.1	21.3	21.5	1.3	. .	1.1	450
As purchased	4	23.3	58.3	16.3	16.5	1.0	. .	0.9	345
Shoulder and clod, lean—									
Edible portion	5	. .	73.1	20.4	20.4	5.4	. .	1.1	605
As purchased	4	18.8	59.4	16.4	16.5	4.4	. .	0.9	490
Shoulder and clod, medium fat—									
Edible portion	14	. .	68.3	19.6	19.3	11.3	. .	1.1	840
As purchased	12	16.4	56.8	16.4	16.1	9.8	. .	0.9	720
Shoulder and clod, fat—									
Edible portion	5	. .	60.4	19.5	18.8	19.8	. .	1.0	1200
As purchased	3	11.9	52.8	17.7	16.7	17.7	. .	0.9	1075
Forequarter, very lean—									
Edible portion	2	. .	74.1	22.1	21.3	3.6	. .	1.0	565
As purchased	2	30.3	51.5	15.4	14.8	2.7	. .	0.9	400
Forequarter, lean—									
Edible portion	4	. .	68.6	18.9	18.4	12.2	. .	0.8	865
As purchased	4	22.3	53.3	14.7	14.3	9.5	. .	0.6	675
Forequarter, medium fat—									
Edible portion	10	. .	60.4	17.9	17.3	21.4	. .	0.9	1235
As purchased	10	18.7	49.1	14.5	14.0	15.5	. .	0.7	1010
Hind quarter, very lean—									
Edible portion	2	. .	72.0	24.0	23.3	3.5	. .	1.2	595
As purchased	2	21.0	56.9	19.0	18.4	2.8	. .	0.9	470
Hind quarter, lean—									
Edible portion	4	.	66.3	20.0	19.3	13.4	. .	1.0	935
As purchased	4	16.6	55.3	16.7	16.1	11.2	. .	0.8	785
Hind quarter, medium fat—									
Edible portion	11	. .	59.8	18.3	17.7	21.6	. .	0.9	1250
As purchased	11	15.7	50.4	15.4	14.9	18.3	. .	0.7	1060

[1] The "clod" usually contains no refuse.

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
BEEF, FRESH (*Continued*).									
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Sides, very lean—									
Edible portion	2	. .	73.1	23.0	22.3	3.5	. .	1.1	575
As purchased	2	26.0	54.0	17.0	16.5	2.7	. .	0.8	430
Sides, lean—									
Edible portion	4	. .	67.2	19.3	18.7	13.2	. .	0.9	915
As purchased	4	19.5	54.1	15.5	15.1	10.6	. .	0.7	735
Sides, medium fat—									
Edible portion	11	. .	59.7	18.1	17.4	22.0	. .	0.9	1265
As purchased	11	17.4	49.4	14.8	14.4	18.1	. .	0.7	1040
BEEF ORGANS.									
Brain, edible portion	1	. .	80.6	8.8	9.0	9.3	. .	1.1	555
Heart, edible portion	2	. .	62.6	16.0	16.0	20.4	. .	1.0	1160
Kidney, edible portion	3	. .	76.7	16.6	16.9	4.8	0.4	1.2	520
Beef liver, edible portion	6	. .	71.2	20.4	21.0	4.5	1.7	1.6	605
Lungs, as purchased	1	. .	79.7	16.4	16.1	3.2	. .	1.0	440
Marrow, as purchased	1	. .	3.3	2.2	2.6	92.8	. .	1.3	3955
Sweetbreads, as purchased	1	. .	70.9	16.8	15.4	12.1	. .	1.6	825
Suet, as purchased	9	. .	13.7	4.7	4.2	81.8	. .	0.3	3540
Tongue—									
Edible portion	3	. .	70.8	18.9	19.0	9.2	. .	1.0	740
As purchased	3	26.5	51.8	14.1	14.2	6.7	. .	0.8	545
BEEF, COOKED.									
Scraps, as purchased	2	. .	23.2	21.4	21.6	51.7	. .	3.5	2580
Roast, as purchased	7	. .	48.2	22.3	21.9	28.6	. .	1.3	1620
Round steak, fat removed, as purchased	18	. .	63.0	27.6	27.5	7.7	. .	1.8	840
Loin steak, tenderloin, broiled, edible portion	6	. .	54.8	23.5	23.6	20.4	. .	1.2	1300
Sandwich meat, as purchased	3	. .	58.3	28.0	27.9	11.0	. .	2.8	985
BEEF, CANNED.									
Boiled beef, as purchased	1	. .	51.8	25.5	24.4	22.5	. .	1.3	1425
Cheek, ox, as purchased	1	. .	66.1	22.2	22.3	8.4	. .	3.2	765
Chili-con-carne, as purch'd	1	. .	75.4	13.3	13.3	4.6	4.0	2.7	515
Collops, minced, as purch'd	1	. .	72.3	17.8	17.9	6.8	1.1	1.9	640
Corned beef	15	. .	51.8	26.3	25.5	18.7	. .	4.0	1280
Dried beef, as purchased	2	. .	44.8	39.2	38.6	5.4	. .	11.2	960
Kidneys, stewed, as purch'd	2	. .	71.9	18.4	. .	5.1	2.1	2.5	600
Roast beef, as purchased	4	. .	58.9	25.9	25.0	14.8	. .	1.3	1105
Rump steak, as purchased	1	. .	56.3	24.3	23.5	18.7	. .	1.5	1240
Sweetbreads, as purchased	1	. .	69.0	20.2	19.5	9.5	. .	2.0	775
Tongue, ground, as purch'd	6	. .	49.9	21.4	21.0	25.1	. .	4.0	1455
Tongue, whole, as purchased	5	. .	51.3	19.5	21.5	23.2	. .	4.0	1340
Tripe, as purchased	2	. .	74.6	16.8	16.4	8.5	. .	0.5	670
BEEF, CORNED AND PICKLED									
Flank—									
Edible portion	2	. .	49.9	14.6	14.2	33.0	. .	2.9	1665
As purchased	2	12.1	43.7	12.9	12.4	29.2	. .	2.6	1470
Rump—									
Edible portion	3	. .	58.1	15.3	15.3	23.3	. .	3.3	1270
As purchased	3	6.0	54.5	14.3	14.4	22.0	. .	3.1	1195
Mess beef, salted—									
Edible portion	2	. .	37.0	12.6	12.0	44.5	. .	6.5	2110
As purchased	2	10.5	33.0	11.2	10.7	39.9	. .	5.9	1890
Corned beef—									
Edible portion	10	. .	53.6	15.6	15.3	26.2	. .	4.9	1395
As purchased	10	8.4	49.2	14.3	14.0	23.8	. .	4.6	1271
Tongues, pickled—									
Edible portion	2	. .	62.3	12.8	12.5	20.5	. .	4.7	1105
As purchased	2	6.0	58.9	11.9	11.6	19.2	. .	4.3	1030
Tripe, as purchased	4	. .	86.5	11.7	11.8	1.2	0.2	0.3	270

Food materials	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
BEEF, DRIED, ETC.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Dried, salted, and smoked—									
Edible portion	7	. .	54.3	30.0	29.7	6.5	(3).4	9.1	840
As purchased	2	4.7	53.7	26.4	25.8	6.9	. .	8.9	780
VEAL, FRESH.									
Breast, lean—									
Edible portion	3	. .	70.3	21.2	20.7	8.0	. .	1.0	730
As purchased	3	23.4	54.0	15.7	16.1	6.2	. .	0.7	560
Breast, medium fat—									
Edible portion	5	. .	66.4	19.4	18.8	13.8	. .	1.0	930
As purchased	5	20.6	52.7	15.6	14.9	11.0	. .	0.8	740
Chuck, medium fat—									
Edible portion	6	. .	73.3	19.7	19.2	6.5	. .	1.0	640
As purchased	6	18.9	59.5	16.0	15.6	5.2	. .	0.8	515
Flank, medium fat, as purchased	5	. .	68.9	20.5	19.7	10.4	. .	1.0	820
Leg, lean—									
Edible portion	9	. .	73.5	21.3	21.2	4.1	. .	1.2	570
As purchased	9	9.1	66.8	19.4	19.3	3.7	. .	1.1	520
Leg, medium fat—									
Edible portion	10	. .	70.0	20.2	19.8	9.0	. .	1.2	755
As purchased	9	14.2	60.1	15.5	16.9	7.9	. .	0.9	620
Leg, cutlets—									
Edible portion	3	. .	70.7	20.3	20.5	7.7	. .	1.1	705
As purchased	3	3.4	68.3	20.1	19.8	7.5	. .	1.0	690
Loin, lean—									
Edible portion	5	. .	73.3	20.4	19.9	5.6	. .	1.2	615
As purchased	5	22.0	57.1	15.9	15.6	4.4	. .	0.9	480
Loin, medium fat—									
Edible portion	6	. .	69.0	19.9	19.2	10.8	. .	1.0	825
As purchased	6	16.5	57.6	16.6	16.0	9.0	. .	0.9	690
Loin, fat—									
Edible portion	2	. .	61.6	18.7	18.5	18.9	. .	1.0	1145
As purchased	2	18.3	50.4	15.3	15.1	15.4	. .	0.8	935
Neck—									
Edible portion	6	. .	72.6	20.3	19.5	6.9	. .	1.0	670
As purchased	6	31.5	49.9	13.9	13.3	4.6	. .	0.7	455
Rib, medium fat—									
Edible portion	9	. .	72.7	20.7	20.1	6.1	. .	1.1	640
As purchased	9	25.3	54.3	15.5	15.0	4.6	. .	0.8	480
Rib, fat—									
Edible portion	3	. .	60.9	18.7	18.8	19.3	. .	1.0	1160
As purchased	3	24.3	46.2	14.2	14.2	14.5	. .	0.8	875
Shank, fore—									
Edible portion	6	. .	74.0	20.7	19.8	5.2	. .	1.0	605
As purchased	6	40.4	44.1	12.2	11.8	3.1	. .	0.6	360
Shank, hind, medium fat—									
Edible portion	6	. .	74.5	20.7	19.9	4.6	. .	1.0	580
As purchased	6	62.7	27.8	7.7	7.4	1.7	. .	0.4	215
Shoulder, lean—									
Edible portion	2	. .	73.4	20.7	20.7	4.6	. .	1.3	580
As purchased	2	18.3	59.9	16.9	16.9	3.9	. .	1.0	480
Shoulder and flank, medium fat—									
Edible portion	2	. .	65.2	19.7	19.3	14.4	. .	1.1	975
As purchased	2	23.0	50.2	15.1	14.9	11.0	. .	0.9	745
Forequarter—									
Edible portion	6	. .	71.7	20.0	19.4	8.0	. .	0.9	710
As purchased	6	24.5	54.2	15.1	14.6	6.0	. .	0.7	535
Hind quarter—									
Edible portion	6	. .	70.9	20.7	19.8	8.3	. .	1.0	735
As purchased	6	20.7	56.2	16.2	15.7	6.6	. .	0.8	580
Side, with kidney, fat and tallow—									
Edible portion	6	. .	71.3	20.2	19.6	8.1	. .	1.0	715
As purchased	6	22.6	55.2	15.6	15.1	6.3	. .	0.8	555

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
VEAL ORGANS.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Kidneys, as purchased . . .	2	. .	75.8	16.9	16.5	6.4	. .	1.3	585
Liver, as purchased	2	. .	73.0	19.0	20.4	5.3	. .	1.3	575
LAMB, FRESH.									
Breast or chuck—									
Edible portion	1	. .	56.2	19.1	19.2	23.6	. .	1.0	1350
As purchased	1	19.1	45.5	15.4	15.5	19.1	. .	0.8	1090
Leg, hind, medium fat—									
Edible portion	2	. .	63.9	19.2	18.5	16.5	. .	1.1	1055
As purchased	2	17.4	52.9	15.9	15.2	13.6	. .	0.9	870
Loin, without kidney and tallow—									
Edible portion	4	. .	53.1	18.7	17.6	28.3	. .	1.0	1540
As purchased	4	14.8	45.3	16.0	15.0	24.1	. .	0.8	1315
Shoulder—									
Edible portion	1	. .	51.8	18.1	17.5	29.7	. .	1.0	1590
As purchased	1	20.3	41.3	14.4	14.0	23.6	. .	0.8	1265
Forequarter—									
Edible portion	1	. .	55.1	18.3	18.1	25.8	. .	1.0	1430
As purchased	1	18.8	44.7	14.9	14.7	21.0	. .	0.8	1165
Hind quarter—									
Edible portion	1	. .	60.9	19.6	19.0	19.1	. .	1.0	1170
As purchased	1	15.7	51.3	16.5	16.0	16.1	. .	0.9	985
Side, without tallow—									
Edible portion	3	. .	58.2	17.6	17.6	23.1	. .	1.1	1300
As purchased	3	19.3	47.0	14.1	14.2	18.7	. .	0.8	1055
LAMB, COOKED.									
Chops, broiled, edible portion	4	. .	47.6	21.7	21.2	29.9	. .	1.3	1665
MUTTON, FRESH.									
Chuck, medium fat—									
Edible portion	6	. .	50.9	15.1	14.6	33.6	. .	0.9	1700
As purchased	6	21.3	39.9	11.9	11.5	26.7	. .	0.6	1350
Chuck, fat—									
Edible portion	2	. .	40.6	13.9	13.7	44.9	. .	0.8	2155
As purchased	2	16.5	33.8	11.6	11.5	37.5	. .	0.7	1800
Flank, medium fat—									
Edible portion	8	. .	46.2	15.2	14.8	38.3	. .	0.7	1900
As purchased	2	9.9	39.0	13.8	13.6	36.9	. .	0.6	1815
Flank, very fat, as purchased	2	. .	28.9	10.7	10.7	59.8	. .	0.6	2725
Leg, hind, lean—									
Edible portion	3	. .	67.4	19.8	19.1	12.4	. .	1.1	890
As purchased	3	16.8	56.1	16.5	15.9	10.3	. .	0.9	740
Leg, hind, medium fat—									
Edible portion	11	. .	62.8	18.5	18.2	18.0	. .	1.0	1105
As purchased	11	18.4	51.2	15.1	14.9	14.7	. .	0.8	900
Loin, without kidney or tallow, medium fat—									
Edible portion	13	. .	50.2	16.0	15.9	33.1	. .	0.8	1695
As purchased	12	16.0	42.0	13.5	13.0	28.3	. .	0.7	1445
Loin, without kidney or tallow, fat—									
Edible portion	3	. .	43.3	14.7	14.2	41.7	. .	0.8	2035
As purchased	3	11.7	38.3	13.0	12.5	36.8	. .	0.7	1795
Neck, medium fat—									
Edible portion	10	. .	58.1	16.9	16.3	24.6	. .	1.0	1355
As purchased	10	27.4	42.1	12.3	11.9	17.9	. .	0.7	985
Shoulder, medium fat—									
Edible portion	7	. .	61.9	17.7	17.3	19.9	. .	0.9	1170
As purchased	7	22.5	47.9	13.7	13.4	15.5	. .	0.7	910
Forequarter—									
Edible portion	10	. .	52.9	15.6	15.3	30.9	. .	0.9	1595
As purchased	10	21.2	41.6	12.3	12.0	24.5	. .	0.7	1265
Hind quarter—									
Edible portion	10	. .	54.8	16.7	16.3	28.1	. .	0.8	1495

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
MUTTON, FRESH (*Continued*).									
Hind quarter (*Continued*)—		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
As purchased	10	17.2	45.4	13.8	13.5	23.2	. .	0.7	1235
Side, including tallow—									
Edible portion	25	. .	54.2	16.3	16.0	28.9	. .	0.9	1520
As purchased	25	18.1	45.4	13.0	12.7	23.1	. .	0.7	1215
Side, not including tallow—									
Edible portion	10	. .	53.6	16.2	15.8	29.8	. .	0.8	1560
As purchased	10	19.3	43.3	13.0	12.7	24.0	. .	0.7	1255
MUTTON, COOKED.									
Mutton, leg roast, edible portion	2	. .	50.9	25.0	25.3	22.6	. .	1.2	1420
MUTTON, ORGANS.									
Heart, as purchased	2	. .	69.5	16.9	17.0	12.6	. .	0.9	845
Kidney fat, as purchased . .	2	. .	3.4	1.8	1.1	95.4	. .	0.1	4060
Liver, as purchased	2	. .	61.2	23.1	. .	9.0	5.0	1.7	905
Lungs, as purchased	2	. .	75.9	20.2	20.1	2.8	. .	1.2	495
MUTTON, CANNED.									
Corned, as purchased	1	. .	45.8	28.8	27.2	22.8	. .	4.2	1500
Tongue, as purchased	1	. .	47.6	24.4	23.6	24.0	. .	4.8	1465
PORK, FRESH.									
Chuck ribs and shoulder—									
Edible portion	2	. .	51.1	17.3	16.9	31.1	. .	0.9	1635
As purchased	2	18.1	41.8	14.1	13.8	25.5	. .	0.8	1340
Flank—									
Edible portion	3	. .	59.0	18.5	17.8	22.2	. .	1.0	1280
As purchased	3	18.0	48.5	15.1	14.2	18.6	. .	0.7	1065
Ham, fresh, lean—									
Edible portion	2	. .	60.0	25.0	24.3	14.4	. .	1.3	1075
As purchased	2	0.9	59.4	24.8	24.2	14.2	. .	1.3	1060
Ham, fresh, medium fat—									
Edible portion	10	. .	53.9	15.3	16.4	28.9	. .	0.8	1505
As purchased	10	10.7	48.0	13.5	14.6	25.9	. .	0.8	1345
Ham, fresh, fat—									
Edible portion	5	. .	38.7	12.4	10.6	50.0	. .	0.7	2345
As purchased	5	13.2	33.6	10.7	9.2	43.5	. .	0.5	2035
Head—									
Edible portion	3	. .	45.3	13.4	12.7	41.3	. .	0.7	1990
As purchased	3	68.4	13.8	4.1	3.8	13.8	. .	0.2	660
Head cheese, edible portion	3	. .	43.3	19.5	16.9	33.8	. .	3.3	1790
Loin (chops), medium fat—									
Edible portion	19	. .	52.0	16 6	16.9	30.1	. .	1.0	1580
As purchased	19	19.7	41.8	13.4	13.5	24.2	. .	0.8	1270
Loin (chops), fat—									
Edible portion	4	. .	41.8	14.5	13.1	44.4	. .	0.7	2145
As purchased	4	16.5	34.8	11.9	10.9	37.2	. .	0.6	1790
Loin, tenderloin, as purch'd	11	. .	66.5	18.9	19.5	13.0	. .	1.0	900
Middle cuts—									
Edible portion	3	. .	48.2	15.7	14.8	36.3	. .	0.7	1825
As purchased	3	19.7	38.6	12.7	12.1	28.9	. .	0.7	1455
Shoulder—									
Edible portion	19	. .	51.2	13.3	13.8	34.2	. .	0.8	1690
As purchased	19	12.4	44.9	12.0	12.2	29.8	. .	0.7	1480
Side, lard and other fat included—									
Edible portion	3	. .	29.4	9.4	8.5	61.7	. .	0.4	2780
As purchased	3	11.2	26.1	8.3	7.5	54.8	. .	0.4	2465
Side, not including lard and kidney—									
Edible portion	11	. .	34.4	9.1	9.8	55.3	. .	0.5	2505
As purchased	11	11.5	30.4	8.6	8.6	49.0	. .	0.5	2215
Clear backs—									
Edible portion	8	. .	25.1	6.4	6.9	67.6	. .	0.4	2970
As purchased	8	5.7	23.7	6.0	6.4	63.8	. .	0.4	2805

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
PORK, FRESH (*Continued*).									
Clear bellies—		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Edible portion	8	. .	31.4	6.9	7.8	60.4	. .	0.4	2675
As purchased	8	6.2	29.5	6.5	7.3	56.6	. .	0.4	2510
Back fat, as purchased	3	. .	7.7	3.6	2.3	89.9	. .	0.1	3860
Belly fat, as purchased	3	. .	13.8	5.2	4.1	81.9	. .	0.2	3555
Ham fat, as purchased	3	.	9.1	3.5	2.7	88.0	. .	0.2	3780
Jowl fat, as purchased	3	. .	16.0	5.9	5.0	78.8	. .	0.2	3435
Feet—									
Edible portion	8	. .	55.4	15.8	17.5	26.3	. .	0.8	1405
As purchased	8	74.1	14.3	4.1	4.5	6.9	. .	0.2	365
Tails—									
Edible portion	8	. .	17.4	4.8	5.2	77.1	. .	0.3	3340
As purchased	8	13.3	15.0	4.1	4.5	66.9	. .	0.3	2900
Trimmings—									
Edible portion	8	. .	23.3	5.4	6.2	70.2	. .	0.3	3060
As purchased	8	7.4	21.6	5.0	5.7	65.0	. .	0.3	2835
PORK ORGANS, ETC.									
Kidneys, as purchased	2	. .	77.8	15.5	16.2	4.8	. .	1.2	490
Liver, as purchased	1	. .	71.4	21.3	21.3	4.5	1.4	1.4	615
Marrow, as purchased	6	. .	14.6	2.3	4.2	81.2	. .	. .	3470
PORK, PICKLED, SALTED, AND SMOKED.									
Ham, smoked, lean—									
Edible portion	3	. .	53.5	19.8	20.2	20.8	. .	5.5	1245
As purchased	3	11.5	47.2	17.5	17.9	18.5	. .	4.9	1105
Ham, smoked, medium fat—									
Edible portion	14	. .	40.3	16.3	16.1	38.8	. .	4.8	1940
As purchased	14	13.6	34.8	14.2	14.0	33.4	. .	4.2	1675
Ham, smoked, fat—									
Edible portion	4	. .	27.9	14.8	16.1	52.3	. .	3.7	2485
As purchased	2	3.4	25.2	12.4	14.2	53.7	. .	3.5	2495
Ham, smoked, boiled, as purchased	2	. .	51.3	20.2	20.2	22.4	. .	6.1	1320
Ham, smoked, fried, as purchased	1	. .	36.6	22.2	24.4	33.2	. .	5.8	1815
Ham, boneless, raw—									
Edible portion	4	.	50.1	14.9	15.4	28.5	. .	6.0	1480
As purchased	4	3.3	48.5	14.3	14.9	27.5	. .	5.8	1425
Ham, luncheon, cooked—									
Edible portion	2	. .	49.2	22.5	24.0	21.0	. .	5.8	1305
As purchased	2	2.1	48.1	22.1	23.5	20.6	. .	5.7	1280
Shoulder, smoked, medium fat—									
Edible portion	3	. .	45.0	15.9	15.8	32.5	. .	6.7	1665
As purchased	3	18.2	36.8	13.0	12.9	26.6	. .	5.5	1365
Shoulder, smoked, fat—									
Edible portion	2	.	26.5	15.1	14,7	53.6	. .	5.2	2545
As purchased	2	20.0	21.4	12.1	11.8	42.6	. .	4.2	2020
Pigs' tongues, pickled—									
Edible portion	2	. .	58.6	17.7	18.0	19.8	. .	3.6	1165
As purchased	2	3.2	56.8	17.1	17.5	19.1	. .	3.4	1125
Pigs' feet, pickled—									
Edible portion	2	. .	68.2	16.3	16.1	14.8	. .	0.9	930
As purchased	2	35.5	44.6	10.2	10.0	9.3	. .	0.6	585
Dry-salted backs—									
Edible portion	2	. .	17.3	7.7	7.2	72.7	. .	2.8	3210
As purchased	2	8.1	15.9	7.1	6.5	66.8	. .	2.7	2950
Dry-salted bellies—									
Edible portion	2	. .	17.7	8.4	6.7	72.2	. .	3.4	3200
As purchased	2	8.2	16.2	7.7	6.2	66.2	. .	3.2	2935
Salt pork, clear fat, as purchased	7	. .	7.9	1.9	2.0	86.2	. .	3.9	3670
Salt pork, lean ends—									
Edible portion	4	. .	19.9	8.4	7.3	67.1	. .	5.7	2985
As purchased	4	11.2	17.6	7.4	6.5	59.6	. .	5.1	2655

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
PORK, PICKLED, SALTED, AND SMOKED (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Bacon, smoked, lean—									
Edible portion	2	. .	31.8	15.5	14.6	42.6	. .	11.0	2085
As purchased	2	17.0	26.5	13.0	12.3	35.5	. .	8.7	1740
Bacon, smoked, medium fat—									
Edible portion	17	. .	18,8	9.9	9.4	67.4	. .	4.4	3030
As purchased	17	7.7	17.4	9.1	8.6	62.2	. .	4.1	2795
Ribs, cooked, as purchased	1	. .	33.6	24.8	26.6	37.6	. .	2.2	2050
Steak, cooked, as purchased	1	. .	33.2	. .	19.9	45.4	. .	1.5	2285
PORK, CANNED.									
Brawn, boars' brains, as purchased	2	. .	49.0	25.2	23.4	23.0	. .	4.6	1440
Boars' heads, as purchased	2	. .	55.3	20.7	19.2	22.2	. .	3.3	1320
Ham, deviled, as purchased	6	. .	44.1	19.0	18.5	34.1	. .	3.3	1790
SAUSAGE.									
Arles—									
Edible portion	1	. .	17.2	26.8	24.9	50.6	. .	7.3	2635
As purchased	1	5.2	16.3	25.4	23.6	48.0	. .	6.9	2495
Banquet—									
Edible portion	1	. .	62.7	18.3	17.9	15.7	. .	3.7	1005
As purchased	1	1.6	61.7	18.0	17.7	15.4	. .	3.6	985
Bologna—									
Edible portion	8	. .	60.0	18.7	18.4	17.6	0.3	3.7	1095
As purchased	4	3.3	55.2	18.2	18.0	19.7	. .	3.8	1170
Farmer—									
Edible portion	1	. .	23.2	29.0	27.2	42.0	. .	7.6	2310
As purchased	1	3.9	22.2	27.9	26.2	40.4	. .	7.3	2225
Frankfort, as purchased	8	. .	57.2	19.6	19.7	18.6	1.1	3.4	1170
Holsteiner—									
Edible portion	1	. .	25.6	29.4	29.4	37.3	3.4	4.3	2220
As purchased	1	2.2	25.1	28.7	28.7	36.5	3.3	4.2	2135
Lyons, pure ham—									
Edible portion	1	. .	32.5	32.3	32.3	27.2	. .	8.0	1750
As purchased	1	10.0	29.2	29.1	29.1	24.5	. .	7.2	1575
Pork, as purchased	11	. .	39.8	13.0	12.7	44.2	1.1	2.2	2125
Pork sausage meat, as purchased	1	. .	46.2	17.4	17.9	32.5	. .	3.4	1695
Pork and beef chopped together, as purchased	1	. .	55.4	19.4	19.5	24.1	. .	1.0	1380
Salmi—									
Edible portion	2	. .	30.5	24.1	22.6	39.9	. .	7.0	2130
As purchased	2	9.3	27.6	21.8	20.5	36.2	. .	6.4	1935
Summer—									
Edible portion	3	. .	23.2	26.0	24.6	44.5	. .	7.7	2360
As purchased	2	7.0	20.9	24.5	23.0	42.1	. .	7.0	2230
Tongue, as purchased	1	. .	46.4	20.1	17.3	33.1	. .	3.2	1770
Wienerwurst, as purchased	1	. .	43.9	28.0	. .	22.1	1.6	4.4	1485
SAUSAGE, CANNED.									
Beef, as purchased	1	. .	59.6	17.9	17.8	20.6	. .	2.0	1200
Bologna, Italian, as purch'd	1	. .	42.6	24.9	23.2	27.8	. .	6.4	1635
Frankfort, as purchased	1	. .	72.7	14.9	14.6	9.9	. .	2.8	695
Oxford, as purchased	1	. .	28.9	9.9	9.9	58.5	0.6	2.1	2665
Pork—									
Edible portion	1	. .	56.6	16.6	16.6	24.8	. .	2.0	1355
As purchased	1	12.6	49.5	14.5	14.5	21.6	. .	1.8	1180
POULTRY AND GAME, FRESH.									
Chicken, broilers—									
Edible portion	3	. .	74.8	21.5	21.6	2.5	. .	1.1	505
As purchased	3	51.6	43.7	12.8	12.6	1.4	. .	0.7	295
Fowls—									
Edible portion	26	. .	63.7	19.3	19.0	16.3	. .	1.0	1045
As purchased	26	25.9	47.1	13.7	14.0	12.3	. .	0.7	775

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
POULTRY AND GAME, FRESH (*Continued*).									
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Goose, young—									
Edible portion	1	. .	46.7	16.3	16.3	36.2	. .	0.8	1830
As purchased	1	17.6	38.5	13.4	13.4	29.8	. .	0.7	1505
Turkey—									
Edible portion	3	. .	55.5	21.1	20.6	22.9	. .	1.0	1360
As purchased	3	22.7	42.4	16.1	15.7	18.4	. .	0.8	1075
Chicken gizzard, as purch'd	1	. .	72.5	24.7	24.7	1.4	. .	1.4	520
Chicken heart, as purchased	1	. .	72.0	20.7	21.1	5.5	. .	1.4	615
Chicken liver, as purchased	1	. .	69.3	22.4	. .	4.2	2.4	1.7	640
Goose gizzard	1	. .	73.8	19.6	19.4	5.8	. .	1.0	610
Goose liver, as purchased . .	1	. .	62.6	16.6	. .	15.9	3.7	1.2	1050
Turkey gizzard, as purchased	1	. .	62.7	20.5	. .	14.5	1.2	1.1	1015
Turkey heart, as purchased	1	. .	68.6	16.8	17.2	13.2	. .	1.0	870
Turkey liver, as purchased .	1	. .	69.6	22.9	. .	5.2	0.6	1.7	655
POULTRY AND GAME, COOKED.									
Capon—									
Edible portion	1	. .	59.9	27.0	27.3	11.5	. .	1.3	985
As purchased	1	10.4	53.6	24.2	24.5	10.3	. .	1.2	885
Capon, with stuffing—									
Edible portion	1	. .	62.1	21.8	. .	10.9	3.8	1.4	935
As purchased	1	7.7	57.2	20.1	. .	10.3	3.5	1.2	875
Chicken, fricasseed, edible portion	1	. .	67.5	17.6	. .	11.5	2.4	1.0	855
Turkey, roast, edible portion	1	. .	52.0	27.8	28.4	18.4	. .	1.2	1295
Turkey, roast, light and dark meat, and stuffing, edible portion	1	. .	65.0	. .	17.1	10.8	5.5	1.6	870
POULTRY AND GAME, CANNED.									
Chicken sandwich, as purchased	1	. .	46.9	20.8	20.5	30.0	. .	2.6	1655
Turkey sandwich, as purch'd	1	. .	47.4	20.7	20.7	29.2	. .	2.7	1615
Plover, roast, as purchased .	1	. .	57.7	22.4	. .	10.2	7.6	2.1	985
Quail, as purchased	1	. .	66.9	21.8	. .	8.0	1.7	1.6	775
FISH, FRESH.									
Alewife, whole—									
Edible portion	2	. .	74.4	19.4	19.2	4.9	. .	1.5	570
As purchased	2	49.5	37.6	9.8	9.7	2.4	. .	0.8	285
Bass, black, whole—									
Edible portion	2	. .	76.7	20.6	20.4	1.7	. .	1.2	455
As purchased	2	54.8	34.6	9.3	9.3	0.8	. .	0.5	205
Bass, red, whole—									
Edible portion	1	. .	81.6	16.9	16.7	0.5	. .	1.2	335
As purchased	1	63.5	29.8	6.2	6.1	0.2	. .	0.4	125
Bass, sea, whole—									
Edible portion	1	. .	79.3	19.8	18.8	0.5	. .	1.4	390
As purchased	1	56.1	34.8	8.7	8.3	0.2	. .	0.6	170
Bass, striped, whole—									
Edible portion	6	. .	77.7	18.6	18.3	2.8	. .	1.2	465
As purchased	5	55.0	35.1	8.4	8.3	1.1	. .	0.5	200
Bass, striped, entrails removed, as purchased . .	1	51.2	37.4	8.8	8.7	2.2	. .	0.5	255
Blackfish, whole—									
Edible portion	4	. .	79.1	18.7	18.5	1.3	. .	1.1	405
As purchased	2	60.2	31.4	7.4	7.3	0.7	. .	0.4	165
Blackfish, entrails removed, as purchased	2	55.7	35.0	8.4	8.3	0.5	. .	0.5	175
Bluefish, entrails removed—									
Edible portion	1	. .	78.5	19.4	19.0	1.2	. .	1.3	410
As purchased	1	48.6	40.3	10.0	9.8	0.6	. .	0.7	210
Buffalo fish, entrails rem'd—									
Edible portion	1	. .	78.6	18.0	17.9	2.3	. .	1.2	430
As purchased	1	52.5	37.3	8.5	8.5	1.1	. .	0.6	205

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
FISH, FRESH (*Continued*).									
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Butter-fish, whole—									
Edible portion	1	. .	70.0	18.0	17.8	11.0	. .	1.2	800
As purchased	1	42.8	40.1	10.3	10.2	6.3	. .	0.6	460
Catfish—									
Edible portion	1	. .	64.1	14.4	14.4	20.6	. .	0.9	1135
As purchased	1	19.4	51.7	11.6	11.6	16.6	. .	0.7	915
Ciscoe, whole, edible portion	3	. .	74.0	18.5	18.1	6.8	. .	1.1	630
Ciscoe, entrails removed, as purchased	2	10.1	65.6	16.3	15.9	7.5	. .	0.9	620
Cod, whole—									
Edible portion	5	. .	82.6	16.5	15.8	0.4	. .	1.2	325
As purchased	2	52.5	38.7	8.4	8.0	0.2	. .	0.6	165
Cod, dressed, as purchased .	3	29.9	58.5	11.1	10.6	0.2	. .	0.8	215
Cod, sections, edible portion	3	. .	82.5	16.7	16.3	0.3	. .	0.9	325
Cod, steaks—									
Edible portion	1	. .	79.7	18.7	18.6	0.5	. .	1.2	370
As purchased	1	9.2	72.4	17.0	16.9	0.5	. .	1.0	335
Cusk, entrails removed—									
Edible portion	1	. .	82.0	17.0	16.9	0.2	. .	0.9	325
As purchased	1	40.3	49.0	10.1	10.1	0.1	. .	0.5	190
Eels, salt water, head, skin, and entrails removed—									
Edible portion	2	. .	71.6	18.6	18.3	9.1	. .	1.0	730
As purchased	2	20.2	57.2	14.8	14.6	7.2	. .	0.8	580
Flounder, whole—									
Edible portion	3	. .	84.2	14.2	13.9	0.6	. .	1.3	290
As purchased	2	61.5	32.6	5.4	5.1	0.3	. .	0.5	115
Flounder, entrails removed, as purchased	1	57.0	35.8	6.4	6.3	0.3	. .	0.6	130
Haddock, entrails removed—									
Edible portion	4	. .	81.7	17.2	16.8	0.3	. .	1.2	335
As purchased	4	51.0	40.0	8.4	8.2	0.2	. .	0.6	165
Hake, entrails removed—									
Edible portion	1	. .	83.1	15.4	15.2	0.7	. .	1.0	315
As purchased	1	52.5	39.5	7.3	7.2	0.3	. .	0.5	150
Halibut, steaks or sections—									
Edible portion	3	. .	75.4	18.6	18.4	5.2	. .	1.0	565
As purchased	3	17.7	61.9	15.3	15.1	4.4	. .	0.9	470
Herring, whole—									
Edible portion	2	. .	72.5	19.5	18.9	7.1	. .	1.5	660
As purchased	2	42.6	41.7	11.2	10.9	3.9	. .	0.9	375
Kingfish, whole—									
Edible portion	1	. .	79.2	18.9	18.7	0.9	. .	1.2	390
As purchased	1	56.6	34.4	8.2	8.1	0.4	. .	0.5	170
Lamprey, whole—									
Edible portion	1	. .	71.1	15.0	14.9	13.3	. .	0.7	840
As purchased	1	45.8	38.5	8.1	8.1	7.2	. .	0.4	455
Mackerel, whole—									
Edible portion	6	. .	73.4	18.7	18.3	7.1	. .	1.2	645
As purchased	5	44.7	40.4	10.2	10.0	4.2	. .	0.7	365
Mackerel, entrails removed, as purchased	1	40.7	43.7	11.6	11.4	3.5	. .	0.7	365
Mullet, whole—									
Edible portion	1	. .	74.9	19.5	19.3	4.6	. .	1.2	555
As purchased	1	57.9	31.5	8.2	8.1	2.0	. .	0.5	235
Muskellunge, whole—									
Edible portion	1	. .	76.3	20.2	19.6	2.5	. .	1.6	480
As purchased	1	49.2	38.7	10.2	10.0	1.3	. .	0.8	245
Perch, white, whole—									
Edible portion	2	. .	75.7	19.3	19.1	4.0	. .	1.2	530
As purchased	2	62.5	28.4	7.3	7.2	1.5	. .	0.4	200
Perch, yellow, whole, edible portion	2	. .	79.3	18.7	18.7	0.8	. .	1.2	380
Pickerel, pike, whole—									
Edible portion	3	. .	79.8	18.7	18.6	0.5	. .	1.1	370
As purchased	2	47.1	42.2	9.9	9.9	0.2	. .	0.6	190

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
FISH, FRESH (*Continued*).									
		Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Cals.
Pike, gray, whole—									
Edible portion	1	. .	80.8	17.9	17.3	0.8	. .	1.1	365
As purchased	1	63.2	29.7	6.6	6.4	0.3	. .	0.4	135
Pollock, dressed—									
Edible portion	1	. .	76.0	21.6	21.7	0.8	. .	1.5	435
As purchased	1	28.5	54.3	15.4	15.5	0.6	. .	1.1	310
Pompano, whole—									
Edible portion	2	. .	72.8	18.8	18.7	7.5	. .	1.0	665
As purchased	2	45.5	39.5	10.3	10.2	4.3	. .	0.5	375
Porgy, whole—									
Edible portion	3	. .	75.0	18.6	18.5	5.1	. .	1.4	560
As purchased	3	60.0	29.9	7.4	7.4	2.1	. .	0.6	225
Red grouper, entrails rem'd—									
Edible portion	2	. .	79.5	19.3	18.8	0.6	. .	1.1	385
As purchased	2	55.9	35.0	8.5	8.4	0.2	. .	0.5	165
Red snapper, whole—									
Edible portion	3	. .	78.5	19.7	19.2	1.0	. .	1.3	410
As purchased	2	46.1	42.0	10.8	10.6	0.6	. .	0.7	225
Salmon, whole—									
Edible portion	6	. .	64.6	22.0	21.2	12.8	. .	1.4	950
As purchased	4	34.9	40.9	15.3	14.4	8.9	. .	0.9	660
Salmon, entrails removed, as purchased	2	29.5	48.1	13.8	13.5	8.1	. .	0.8	600
Salmon, landlocked, whole, spent—									
Edible portion	4	. .	77.7	17.8	17.8	3.3	. .	1.2	470
As purchased	4	45.5	42.3	9.7	9.8	1.8	. .	0.6	255
Salmon, California, anterior sections—									
Edible portion	2	. .	63.6	17.8	17.5	17.8	. .	1.1	1080
As purchased	1	10.3	57.9	16.7	16.1	14.8	. .	0.9	935
Shad, whole—									
Edible portion	7	. .	70.6	18.8	18.6	9.5	. .	1.3	750
As purchased	7	50.1	35.2	9.4	9.2	4.8	. .	0.7	380
Shad roe, as purchased	1	. .	71.2	20.9	. .	3.8	2.6	1.5	600
Sheepshead, whole—									
Edible portion	2	. .	75.6	20.1	19.5	3.7	. .	1.2	530
As purchased	1	66.0	26.9	6.6	6.4	0.2	. .	0.5	130
Skate, lobe of body—									
Edible portion	1	. .	82.2	18.2	15.3	1.4	. .	1.1	400
As purchased	1	51.0	40.2	8.9	7.5	0.7	. .	0.6	195
Smelt, whole—									
Edible portion	2	. .	79.2	17.6	17.3	1.8	. .	1.7	405
As purchased	2	41.9	46.1	10.1	10.0	1.0	. .	1.0	230
Spanish mackerel, whole—									
Edible portion	1	. .	68.1	21.5	21.0	9.4	. .	1.5	795
As purchased	1	34.6	44.5	14.1	13.7	6.2	. .	1.0	525
Sturgeon, anterior sections—									
Edible portion	1	. .	78.7	18.1	18.0	1.9	. .	1.4	415
As purchased	1	14.4	67.4	15.1	15.4	1.6	. .	1.2	350
Tomcod, whole—									
Edible portion	1	. .	81.5	17.2	17.1	0.4	. .	1.0	335
As purchased	1	59.9	32.7	6.9	6.8	0.2	. .	0.4	135
Trout, brook, whole—									
Edible portion	3	. .	77.8	19.2	18.9	2.1	. .	1.2	445
As purchased	3	48.1	40.4	9.9	9.8	1.1	. .	0.6	230
Trout, salmon or lake—									
Edible portion	2	. .	70.8	17.8	17.7	10.3	. .	1.2	765
As purchased	2	48.5	36.6	9.1	9.2	5.1	. .	0.6	385
Turbot—									
Edible portion	1	. .	71.4	14.8	12.9	14.4	. .	1.3	885
As purchased	1	47.7	37.3	7.7	6.8	7.5	. .	0.7	460
Weakfish, whole—									
Edible portion	1	. .	79.0	17.8	17.4	2.4	. .	1.2	430
As purchased	1	51.9	38.0	8.6	8.4	1.1	. .	0.6	205

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
FISH, FRESH (*Continued*).									
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Whitefish, whole—									
Edible portion	1	. .	69.8	22.9	22.1	6.5	. .	1.6	700
As purchased	1	53.5	32.5	10.6	10.3	3.0	. .	0.7	325
FISH, COOKED.									
Bluefish, cooked, edible portion	1	. .	68.2	25.9	26.1	4.5	. .	1.2	670
Spanish mackerel, broiled—									
Edible portion	1	. .	68.9	23.7	23.2	6.5	. .	1.4	715
As purchased	1	7.9	63.5	21.8	21.4	5.9	. .	1.3	655
FISH, PRESERVED AND CANNED.									
Cod, salt—									
Edible portion	2	. .	53.5	25.4	21.5	0.3	. .	24.7	410
As purchased	2	24.9	40.2	19.0	16.0	0.4	. .	18.5	315
Cod, salt, "boneless"—									
Edible portion	2	. .	55.0	27.3	25.7	0.3	. .	19.0	490
As purchased	1	1.6	54.8	27.7	28.6	0.3	. .	14.7	545
Haddock, smoked—									
Edible portion	1	. .	72.5	23.3	23.7	0.2	. .	3.6	440
As purchased	1	32.2	49.2	15.8	16.1	0.1	. .	2.4	305
Haddock, smoked, cooked, canned, as purchased	1	. .	68.7	22.3	21.8	2.3	. .	7.2	510
Halibut, smoked—									
Edible portion	2	. .	49.4	20.7	20.6	15.0	. .	15.0	1020
As purchased	2	7.0	46.0	19.3	19.1	14.0	. .	13.9	950
Herring, smoked—									
Edible portion	1	. .	34.6	36.9	36.4	15.8	. .	13.2	1355
As purchased	1	44.4	19.2	20.5	20.2	8.8	. .	7.4	750
Lamprey, canned—									
Edible portion	1	. .	63.3	16.9	. .	12.2	3.6	4.0	895
As purchased	1	18.2	51.7	13.8	. .	10.0	3.0	3.3	735
Mackerel, salt, entrails removed—									
Edible portion	1	. .	42.2	21.1	22.0	22.6	. .	13.2	1345
As purchased	1	22.9	32.5	16.3	17.0	17.4	. .	10.2	1035
Mackerel, salt, canned, as purchased	1	. .	68.2	19.6	19.9	8.7	. .	3.2	730
Mackerel, salt, canned in oil—									
Edible portion	1	. .	58.3	25.4	23.5	14.1	. .	4.1	1065
As purchased	1	31.5	39.9	17.4	16.1	9.7	. .	2.8	735
Mackerel, salt, dressed—									
Edible portion	2	. .	43.4	17.3	17.3	26.4	. .	12.9	1435
As purchased	2	19.7	34.8	13.9	13.9	21.2	. .	10.4	1155
Minogy, pickled, canned—									
Edible portion	1	. .	56.5	22.0	21.9	18.6	. .	3.0	1195
As purchased	1	18.7	46.0	17.9	17.8	15.1	. .	2.4	970
Pilchard in tomatoes, canned, Russia, as purchased	1	. .	52.7	27.9	27.5	15.8	. .	4.0	1185
Salmon, canned—									
Edible portion	7	. .	63.5	21.8	21.8	12.1	. .	2.6	915
As purchased	3	14.2	56.8	19.5	19.5	7.5	. .	2.0	680
Sardines, canned—									
Edible portion	2	. .	52.3	23.0	22.4	19.7	. .	5.6	1260
As purchased	1	5.0	53.6	23.7	24.0	12.1	. .	5.3	950
Sturgeon, dried, Russia—									
Edible portion	1	. .	50.6	31.8	32.2	9.6	. .	7.6	995
As purchased	1	12.7	44.1	27.8	28.1	8.4	. .	6.7	870
Sturgeon, caviare, pressed, Russia, as purchased	1	. .	38.1	30.0	. .	19.7	7.6	4.6	1530
Trout, brook—									
Edible portion	1	. .	68.4	22.3	22.8	6.1	. .	3.7	670
As purchased	1	3.5	66.1	21.5	20.9	5.9	. .	3.6	650
Tunney, as purchased	1	. .	72.7	21.7	21.5	4.1	. .	1.7	575

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
AMPHIBIA.									
Frogs' legs—		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Edible portion	2	. .	83.7	15.5	15.1	0.2	. .	1.5	295
As purchased	2	32.0	56.9	10.5	10.3	0.1	. .	0.7	200
SHELLFISH, ETC., FRESH.									
Clams, long, in shell—									
Edible portion	4	. .	85.8	8.6	. .	1.0	2.0	2.6	240
As purchased	4	41.9	49.9	5.0	. .	0.6	1.1	1.5	140
Clams, round, in shell—									
Edible portion	1	. .	86.2	6.5	. .	0.4	4.2	2.7	215
As purchased	1	67.5	28.0	2.1	. .	0.1	1.4	0.9	70
Clams, round, removed from shell, as purchased . . .	1	. .	80.8	10.6	. .	1.1	5.2	2.3	340
Crabs, hardshell, whole—									
Edible portion	1		77.1	16.6	. .	2.0	1.2	3.1	415
As purchased	1	52.4	36.7	7.9	. .	0.9	0.6	1.5	195
Crayfish, abdomen, whole—									
Edible portion	1	. .	81.2	16.0	. .	0.5	1.0	1.3	340
As purchased	1	86.6	10.9	2.1	. .	0.1	0.1	0.2	45
Lobster, whole—									
Edible portion	5	. .	79.2	16.4	. .	1.8	0.4	2.2	390
As purchased	5	61.7	30.7	5.9	. .	0.7	0.2	0.8	140
Mussels, in shell—									
Edible portion	1	. .	84.2	8.7	. .	1.1	4.1	1.9	285
As purchased	1	46.7	44.9	4.6	. .	0.6	2.2	1.0	150
Oysters, in shell—									
Edible portion	34	. .	86.9	6.2	. .	1.2	3.7	2.0	235
As purchased	34	81.4	16.1	1.2	. .	0.2	0.7	0.4	45
Oysters, solids, as purchased	9	. .	88.3	6.0	. .	1.3	3.3	1.1	230
Scallops, as purchased . . .	2	. .	80.3	14.8	. .	0.1	3.4	1.4	345
Terrapin—									
Edible portion	1	. .	74.5	21.2	21.0	3.5	. .	1.0	545
As purchased	1	75.4	18.3	5.2	5.2	0.9	. .	0.2	135
Turtle, green, whole—									
Edible portion	1	. .	79.8	19.8	18.5	0.5	. .	1.2	390
As purchased	1	76.0	19.2	4.7	4.4	0.1	. .	0.3	90
SHELLFISH, ETC., CANNED.									
Clams, long, as purchased .	1	. .	84.5	9.0	. .	1.3	2.9	2.3	275
Clams, round, as purchased .	1	. .	82.9	10.5	. .	0.8	3.0	2.8	285
Crabs, as purchased	2	. .	80.0	15.8	. .	1.5	0.7	2.0	370
Lobster, as purchased	2	. .	77.8	18.1	. .	1.1	0.5	2.5	390
Oysters, as purchased	4	. .	83.4	8.8	. .	2.4	3.9	1.5	335
Shrimp, as purchased	1	. .	70.8	25.4	. .	1.0	0.2	2.6	520
EGGS.									
Hens', uncooked—[1]									
Edible portion	60	.	73.7	13.4	14.8	10.5	. .	1.0	720
As purchased	.	11.2	65.5	11.9	13.1	9.3	. .	0.9	635
Hen's, boiled—									
Edible portion	19	. .	73.2	13.2	14.0	12.0	. .	0.8	765
As purchased	.	11.2	65.0	11.7	12.4	10.7	. .	0.7	680
Hens', boiled whites, edible portion	11	. .	86.2	12.3	13.0	0.2	. .	0.6	250
Hens', boiled yolks, edible portion	11	. .	49.5	15.7	16.1	33.3	. .	1.1	1705

[1] Eggs are difficult of analysis and the discrepancy between the protein by factor and by difference may be due in part to incomplete determination of nitrogen and fat. It is also probable that the factor 6.25 is not correct for eggs. The value of protein by difference is perhaps the more nearly correct, and has been used in the computation of the fuel-value per pound.

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
ANIMAL FOOD (*Continued*).									
DAIRY PRODUCTS, ETC.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Butter, as purchased	.	. .	11.0	1.0	. .	85.0	. .	3.0	3605
Buttermilk, as purchased . .	.	. .	91 0	3.0	. .	0.5	4.8	0.7	165
Cheese, American pale, as purchased	1	. .	31.6	28.8	. .	35.9	0.3	3.4	2055
Cheese, American red, as purchased	1	. .	28.6	. .	29.6	38.3	. .	3.5	2165
Cheese, Boudon, as purchased	1	. .	55.2	15.4	. .	20.8	1.6	7.0	1195
Cheese, California flat, as purchased	4	. .	34.0	24.3	. .	33.4	4.5	3.8	1945
Cheese, Cheddar, as purch'd	6	. .	27.4	27.7	. .	36.8	4.1	4.0	2145
Cheese, Cheshire, as purch'd	1	. .	37.1	26.9	. .	30.7	0.9	4.4	1810
Cheese, cottage, as purchased	2	. .	72.0	20.9	. .	1.0	4.3	1.8	510
Cheese, Crown brand cream, as purchased	1	. .	31.4	5.2	. .	58.0	2.2	3.2	2585
Cheese, Dutch, as purchased	2	. .	35.2	. .	37.1	17.7	. .	10.0	1435
Cheese, Fromage de Brie, as purchased	1	. .	60.2	15.9	. .	21.0	1.4	1.5	1210
Cheese, full cream, as purch'd	25	. .	34.2	25.9	. .	33.7	2.4	3.8	1950
Cheese, imitation full cream, Ohio, as purchased . . .	1	. .	37.9	. .	25.9	31.7	. .	4.5	1820
Cheese, imitation old English, as purchased	1	. .	20.7	30.1	. .	42.7	1.3	5.2	2385
Cheese, Limburger, as purchased	1	. .	42.1	23.0	. .	29.4	0.4	5.1	1675
Cheese, Neuchatel, as purchased	2	. .	50.0	18.7	. .	27.4	1.5	2.4	1530
Cheese, partly skimmed milk, as purchased	3	. .	38.2	25.4	. .	29.5	3.6	3.3	1785
Cheese, pineapple, as purch'd	5	. .	23.0	29.9	. .	38.9	2.6	5.6	2245
Cheese, Roquefort, as purch'd	1	. .	39.3	22.6	. .	29.5	1.8	6.8	1700
Cheese, skimmed milk, as purchased	9	. .	45.7	31.5	. .	16.4	2.2	4.2	1320
Cheese, Swiss, as purchased .	2	. .	31.4	27.6	. .	34.9	1.3	4.8	2010
Cheese, whole milk. (*See* Full cream cheese.)									
Cream, as purchased	.	. .	74.0	2.5	. .	18.5	4.5	0.5	910
Kumiss, as purchased . . .	8	. .	89.3	2.8	. .	2.1	5.4	0.4	240
Milk, condensed, sweetened, as purchased	24	. .	26.9	8.8	. .	8.3	54.1	1.9	1520
Milk, condensed, unsweetened, "evaporated cream," as purchased . .	6	. .	68.2	9.6	. .	9.3	11.2	1.7	780
Milk, skimmed, as purchased	.	. .	90.5	3.4	. .	0.3	5.1	0.7	170
Milk, whole, as purchased .	.	. .	87.0	3.3	. .	4.0	5.0	0.7	325
Whey, as purchased	.	. .	93.0	1.0	. .	0.3	5.0	0.7	125
MISCELLANEOUS.									
Gelatin, as purchased	6	. .	13.6	91.4	84.2	0.1	. .	2.1	1705
Calf's foot jelly, as purchased	1	. .	77.6	4.3	. .	. .	17.4	0.7	405
Isinglass, sturgeon, as purchased	1	. .	19.0	89.3	77.4	1.6	. .	2.0	1730
Spinal column, sturgeon, as purchased	1	. .	17.7	59.8	. .	17.1	0.8	4.6	1850
Lard, refined, as purchased .	1	. .	. .	. .	. .	100.0	. .	. .	4220
Lard, unrefined, as purch'd .	3	. .	4.8	2.2	1.1	94.0	. .	0.1	4010
Tallow, refined, as purch'd .	1	. .	. .	. .	. .	100.0	. .	. .	4220
Cottolene, as purchased . . .	1	. .	. .	. .	. .	100.0	. .	. .	4220
Oleomargarine, as purchased	41	. .	9.5	1.2	. .	83.0	. .	6.3	3525
Beef juice, as purchased . .	1	. .	93.0	4.9	. .	0.6	. .	1.5	115

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbo-hydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD.									
FLOURS, MEALS, ETC.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Barley, granulated	1	. .	10.9	7.5	0.9	79 8	0.7	0.9	1660
Barley meal and flour	3	. .	11.9	10.5	2.2	72.8	6.5	2.6	1640
Barley, pearled	3	. .	11.5	8.5	1.1	77.8	0.3	1.1	1650
Buckwheat flour	17	. .	13.6	6.4	1.2	77.9	0.4	0.9	1620
Buckwheat preparations—									
Farina and groats	2	. .	10.9	4.1	0.4	84.1	0.2	0.5	1660
Self-raising	14	. .	11.6	8.2	1.2	73.4	0.4	5.6	1570
Corn flour	3	. .	12.6	7.1	1.3	78.4	0.9	0.6	1645
Corn meal, granular	19	. .	12.5	9.2	1.9	75.4	1.0	1.0	1655
Corn meal, unbolted—									
Edible portion	7	. .	11.6	8.4	4.7	74.0	. .	1.3	1730
As purchased	7	10.9	10.3	7.5	4.2	65.9	. .	1.2	1545
Pop corn	2	. .	4.3	10.7	5.0	78.7	1.4	1.3	1875
Corn preparations—									
Ceraline	5	. .	10.3	9.6	1.1	78.3	0.4	0.7	1680
Hominy	17	. .	11.8	8.3	0.6	79.0	0.9	0.3	1650
Hominy, cooked	1	. .	79.3	2.2	0.2	17.8	. .	0.5	380
Parched	2	. .	5.2	11.5	8.4	72.3	. .	2.6	1915
Kafir corn	1	. .	16.8	6.6	3.8	70.6	1.1	2.2	1595
Oatmeal	16	. .	7.3	16.1	7.2	67.5	0.9	1.9	1860
Oatmeal, boiled	1	. .	84.5	2.8	0.5	11.5	. .	0.7	285
Oatmeal gruel	2	. .	91.6	1.2	0.4	6.3	. .	0.5	155
Oatmeal water	2	. .	96.0	0.7	0.1	2.9	. .	0.3	70
Oats, other preparations—									
Rolled oats	20	. .	7.7	16.7	7.3	66.2	1.3	2.1	1850
Miscellaneous	26	. .	7.9	16.3	7.3	66.8	0.9	1.7	1855
All analyses, average	46	. .	7.8	16.5	7.3	66.5	1.0	1.9	1850
Rice	21	. .	12.3	8.0	0.3	79.0	0.2	0.4	1630
Rice, boiled	3	. .	72.5	2.8	0.1	24.4	. .	0.2	525
Rice, flaked	2	. .	9.5	7.9	0.4	81.9	0.2	0.3	1685
Rice flour	4	. .	8.5	8.6	6.1	68.0	16.1	8.8	1680
Rye flour	8	. .	12.9	6.8	0.9	78.7	0.4	0.7	1630
Rye meal	1	. .	11.4	13.6	2.0	71.5	1.8	1.5	1665
Wheat flour, California fine	3	. .	13.8	7.9	1.4	76.4	. .	0.5	1625
Wheat flour, entire wheat	9	. .	11.4	13.8	1.9	71.9	0.9	1.0	1675
Wheat flour, gluten	5	. .	12.0	14.2	1.8	71.1	0.6	0.9	1665
Wheat flour, Graham	13	. .	11.3	13.3	2.2	71.4	1.9	1.8	1670
Wheat flour, prepared (self-raising)	29	. .	10.8	10.2	1.2	73.0	0.4	4.8	1600
Wheat flour, patent roller process, bakers' grade	14	. .	11.9	13.3	1.5	72.7	0.7	0.6	1665
Wheat flour, patent roller process, family and straight grade—									
Spring wheat	3	. .	11.9	10.9	1.1	75.6	0.1	0.5	1655
Winter wheat	6	. .	13.1	12.3	1.1	73.0	0.3	0.5	1635
Undesignated	19	. .	12.9	10.4	1.0	75.2	0.1	0.5	1635
All analyses, average	28	. .	12.8	10.8	1.1	74.8	0.2	0.5	1640
Wheat flour, patent roller process, grade not indicated	111	. .	11.5	11.4	1.0	75.6	0.2	0.5	1660
Wheat flour, patent roller process, high grade—									
Spring wheat	23	. .	12.3	11.7	1.1	74.5	0.1	0.4	1650
Winter wheat	6	. .	13.3	11.0	0.9	74.4	0.3	0.4	1625
Undesignated	28	. .	12.5	10.8	1.0	75.2	0.1	0.5	1640
All analyses, average	57	. .	12.4	11.2	1.0	74.9	0.2	0.5	1645
Average of all analyses of high and medium grades and grade not indicated	210	. .	12.0	11.4	1.0	75.1	0.3	0.5	1650
Wheat flour, patent roller process, low grade	13	. .	12.0	14.0	1.9	71.2	0.8	0.9	1665
Wheat flour, unclass. process, grade not indicated—									
Spring wheat	4	. .	12.4	10.5	1.0	75.4	0.5	0.7	1640

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
FLOURS, MEALS, ETC. (*Cont'd*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Wheat flour, etc. (*Continued*)—									
Winter wheat	21	. .	11.9	10.7	1.0	75.8	0.4	0.6	1650
Undesignated	8	. .	9.4	10.4	1.2	78.4	0.9	0.6	1700
All analyses, average	33	. .	11.4	10.6	1.1	76.3	0.2	0.6	1665
Wheat preparations, breakfast foods—									
Cracked and crushed	11	. .	10.1	11.1	1.7	75.5	1.7	1.6	1685
Farina	9	. .	10.9	11.0	1.4	76.3	0.4	0.4	1685
Flaked	7	. .	8.7	13.4	1.4	74.3	1.8	2.2	1690
Germs	10	. .	10.4	10.5	2.0	76.0	0.9	1.1	1695
Glutens	3	. .	8.9	13.6	1.7	74.6	1.3	1.2	1715
Miscellaneous	22	. .	9.4	13.1	2.1	74.1	0.9	1.3	1710
Parched and toasted	6	. .	8.6	13.6	2.4	74.5	0.8	0.9	1740
Shredded	6	. .	8.1	10.5	1.4	77.9	1.7	2.1	1700
All analyses, average	74	. .	9.6	12.1	1.8	75.2	1.0	1.3	1700
Wheat preparations—									
Macaroni	11	. .	10.3	13.4	0.9	74.1	. .	1.3	1665
Macaroni, cooked	1	. .	78.4	3.0	1.5	15.8	. .	1.3	415
Noodles	2	. .	10.7	11.7	1.0	75.6	0.4	1.0	1665
Spaghetti	3	. .	10.6	12.1	0.4	76.3	0.4	0.6	1660
Vermicelli	15	. .	11.0	10.9	2.0	72.0	. .	4.1	1625
BREAD, CRACKERS, PASTRY, ETC.									
Bread, brown, as purchased	2	. .	43.6	5.4	1.8	47.1	. .	2.1	1050
Bread, cassava, as purchased	1	. .	10.5	9.1	0.3	79.0	. .	1.1	1650
Bread, corn (johnnycake), as purchased	5	. .	38.9	7.9	4.7	46.3	. .	2.2	1205
Bread, rye, as purchased	21	. .	35.7	9.0	0.6	53.2	0.5	1.5	1180
Bread, rye, black, as purch'd	1	. .	36.9	9.6	0.6	48.9	. .	4.0	1115
Bread, rye, whole, as purch'd	2	. .	50.7	11.9	0.6	35.9	1.2	0.9	915
Bread, rye and wheat, as purchased	1	. .	35.3	11.9	0.3	51.5	. .	1.0	1190
Bread, wheat—									
Buns, as purchased	1	. .	29.0	6.3	6.5	57.3	0.4	0.9	1455
Buns, cinnamon, as purch'd	1	. .	23.6	9.4	7.2	59.1	. .	0.7	1575
Buns, currant, as purch'd	1	. .	27.5	6.7	7.6	57.6	1.1	0.6	1515
Buns, hot cross, as purch'd	1	. .	36.7	7.9	4.8	49.7	. .	0.9	1275
Buns, sugar, as purchased	3	. .	29.6	8.1	6.9	54.2	0.3	1.2	1450
Gluten bread, as purchased	6	. .	38.2	9.3	1.4	49.8	. .	1.3	1160
Graham bread, as purch'd	27	. .	35.7	8.9	1.8	52.1	1.1	1.5	1210
Biscuit, homemade, as purchased	3	. .	32.9	8.7	2.6	55.3	0.7	0.5	1300
Biscuit, Maryland, as purchased	2	. .	24.6	8.4	5.6	60.1	1.3	1.3	1510
Biscuit, soda, as purchased	1	. .	22.9	9.3	13.7	52.6	. .	1.5	1730
Rolls, French, as purchased	2	. .	32.0	8.5	2.5	55.7	0.6	1.3	1300
Rolls, plain, as purchased	5	. .	25.2	9.7	4.2	59.9	0.3	1.0	1470
Rolls, Vienna, as purch'd	1	. .	31.7	8.5	2.2	56.5	0.4	1.1	1300
Rolls, water, as purchased	2	. .	32.6	9.0	3.0	54.2	. .	1.2	1300
Rolls, all analyses, as purchased	20	. .	29.2	8.9	4.1	56.7	0.6	1.1	1395
Rolls, large, cheap, as purchased	1	. .	29.4	9.4	0.8	59.4	. .	1.0	1315
Toasted bread, as purch'd	5	. .	24.0	11.5	1.6	61.2	. .	1.7	1420
White bread, biscuit, as purchased	3	. .	35.2	8.0	1.4	54.3	0.3	1.1	1220
White bread, butter, as purchased	1	. .	32.2	7.9	1.1	57.7	0.4	1.1	1265
White bread, cheap grade, as purchased	6	. .	33.2	10.9	1.3	53.6	. .	1.0	1255
White bread, cream, as purchased	6	. .	33.2	9.8	0.9	55.0	0.2	1.1	1245
White bread, homemade, as purchased	38	. .	35.0	9.1	1.6	53.3	0.2	1.0	1225

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
BREAD, CRACKERS, PASTRY, ETC. (*Continued*).									
Bread, wheat (*Continued*)—		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
White bread, milk, as purchased	8	. .	36.5	9.6	1.4	51.1	. .	1.4	1190
White bread, miscellaneous, as purchased	103	. .	35.6	9.3	1.2	52.7	0.5	1.2	1205
White bread, New England, as purchased	7	. .	36.6	9.1	1.2	52.1	. .	1.0	1190
White bread, Quaker, as purchased	4	. .	35.8	8.3	1.1	53.7	0.3	1.1	1200
White bread, split, as purchased	3	. .	34.6	9.3	1.0	54.1	0.2	1.0	1220
White bread, Vienna, as purchased	25	. .	34.2	9.4	1.2	54.1	0.5	1.1	1230
White bread, all analyses, as purchased, average . .	198	. .	35.3	9.2	1.3	53.1	0.5	1.1	1215
Whole wheat bread, as purchased	12	. .	38.4	9.7	0.9	49.7	1.2	1.3	1140
Zwieback, as purchased . .	4	. .	5.8	9.8	9.9	73.5	. .	1.0	1970
Crackers—									
Boston (split) crackers, as purchased	2	. .	7.5	11.0	8.5	71.1	0.8	1.9	1885
Butter crackers, as purch'd	3	. .	7.2	9.6	10.1	71.6	0.4	1.5	1935
Cream crackers, as purch'd	9	. .	6.8	9.7	12.1	69.7	4.6	1.7	1990
Egg crackers, as purchased	2	. .	5.8	12.6	14.0	66.6	0.4	1.0	2060
Flatbread, as purchased .	3	. .	9.8	14.9	0.5	73.6	. .	1.2	1665
Graham crackers, as purchased	4	. .	5.4	10.0	9.4	73.8	1.5	1.4	1955
Miscellaneous, as purch'd	21	. .	7.1	10.2	8.8	72.4	0.4	1.5	1905
Oatmeal crackers, as purchased	2	. .	6.3	11.8	11.1	69.0	1.9	1.8	1970
Oyster crackers, as purch'd	7	. .	4.8	11.3	10.5	70.5	0.2	2.9	1965
Pilot bread, as purchased .	3	. .	8.7	11.1	5.0	74.2	0.3	1.0	1800
Pretzels, as purchased . . .	2	. .	9.6	9.7	3.9	72.8	0.5	4.0	1700
Saltines, as purchased . . .	2	. .	5.6	10.6	12.7	68.5	0.5	2.6	2005
Soda crackers, as purch'd .	5	. .	5.9	9.8	9.1	73.1	0.3	2.1	1925
Water crackers, as purch'd	6	. .	6.4	11.7	5.0	75.7	0.4	1.2	1835
All analyses, as purchased, average	71	. .	6.8	10.7	8.8	71.9	0.5	1.8	1905
Cracker meal, as purchased	2	. .	9.2	10.9	6.0	72.9	0.2	1.0	1810
Cake—									
Baker's cake, as purchased	2	. .	31.4	6.3	4.6	56.9	. .	0.8	1370
Chocolate layer cake, as purchased	1	. .	20.5	6.2	8.1	64.1	. .	1.1	1650
Coffee cake, as purchased .	5	. .	21.3	7.1	7.5	63.2	0.4	0.9	1625
Cup cake, as purchased . .	2	. .	15.6	5.9	9.0	68.5	0.3	1.0	1765
Drop cake, as purchased .	1	. .	16.6	7.6	14.7	60.3	0.1	0.8	1885
Frosted cake, as purchased	7	. .	18.2	5.9	9.0	64.8	. .	2.1	1695

	Water.	Protein.	Fat.	Carbohydrates.	Fiber.	Ash.	Fuel-value per pound.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
White bread from high-grade patent flour	32.9	8.7	1.4	56.5	. .	0.5	1270
White bread from regular patent flour . .	34.1	9.0	1.3	54.9	. .	0.7	1245
White bread from baker's flour	39.1	10.6	1.2	48.3	. .	0.9	1145
White bread from low-grade flour	40.7	12.6	1.1	44.3	. .	1.3	1105

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
BREAD, CRACKERS, PASTRY, ETC. (*Continued*).									
Cake (*Continued*)—		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Fruit cake, as purchased	4	. .	17.3	5.9	10.9	64.1	. .	1.8	1760
Gingerbread, as purchased	2	. .	18.8	5.8	9.0	63.5	0.9	2.9	1670
Miscellaneous, as purch'd	4	. .	21.9	5.9	10.6	60.1	. .	1.5	1675
Sponge cake, as purchased	3	. .	15.3	6.3	10.7	65.9	. .	1.8	1795
All analyses, except fruit, as purchased, average	27	. .	19.9	6.3	9.0	63.3	0.4	1.5	1675
Cookies, cakes, etc.—									
Molasses cookies, as purchased	6	. .	6.2	7.2	8.7	75.7	. .	2.2	1910
Miscellaneous cookies, as purchased	5	. .	10.3	6.7	9.6	72.4	1.2	1.0	1875
Sugar cookies, as purchased	9	. .	8.3	7.0	10.2	73.2	1.1	1.3	1920
All analyses, as purchased, average	20	. .	8.1	7.0	9.7	73.7	0.5	1.5	1910
Fig biscuits or bars, as purchased	1	. .	17.9	4.6	6.6	69.8	1.7	1.1	1660
Ginger snaps, as purchased	7	. .	6.3	6.5	8.6	76.0	0.7	2.6	1895
Lady fingers, as purchased	3	. .	15.0	8.8	5.0	70.6	0.2	0.6	1685
Macaroons, as purchased	4	. .	12.3	6.5	15.2	65.2	1.1	0.8	1975
Wafers, miscellaneous, as purchased	5	. .	6.6	8.7	8.6	74.5	0.4	1.6	1910
Wafers, vanilla, as purch'd	6	. .	6.7	6.6	14.0	71.6	0.3	1.1	2045
Wafers, all analyses, as purchased, average	11	. .	6.6	7.6	11.6	72.9	0.3	1.3	1985
Miscellaneous cakes, as purchased	17	. .	8.2	7.4	9.0	74.0	0.3	1.2	1900
Doughnuts, as purchased	9	. .	18.3	6.7	21.0	53.1	0.7	0.9	2000
Jumbles, as purchased	4	. .	14.3	7.4	13.5	63.7	0.5	1.1	1890
Pie, apple, as purchased	4	. .	42.5	3.1	9.8	42.8	. .	1.8	1270
Pie, cream, as purchased	3	. .	32.0	4.4	11.4	51.2	. .	1.0	1515
Pie, custard, as purchased	1	. .	62.4	4.2	6.3	26.1	. .	1.0	830
Pie, lemon, as purchased	1	. .	47.4	3.6	10.1	37.4	. .	1.5	1190
Pie, mince, as purchased	3	. .	41.3	5.8	12.3	38.1	. .	2.5	1335
Pie, raisin, as purchased	1	. .	37.0	3.0	11.3	47.2	. .	1.5	1410
Pie, squash, as purchased	1	. .	64.2	4.4	8.4	21.7	. .	1.3	840
Pudding, Indian-meal, as purchased	1	. .	60.7	5.5	4.8	27.5	. .	1.5	815

Average Composition of Some Common Candies.

	Number of analyses.	Water.	Sucrose.	Invert sugar.	Ash.	Insoluble in cold water.	Remarks.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per cent.*	
Broken candy	8	4.6	75.3	14.0	2.7	0.9 in one sample	
Cream candy	20	5.3	77.1	8.7	0.1	0.2 in one sample	
Marshmallows	3	5.6	33.3	24.1	1.1	27.0	One sample contained 44.8 per cent. insoluble matter (starch and flour).
Caramels	3	3.3	37.5	15.2	1.4	32.2	One sample contained 66.3 per cent. insoluble matter (starch and flour).
Chocolate creams	1	3.8	58.3	13.8	0.5	15.4	

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
BREAD, CRACKERS, PASTRY, ETC. (*Continued*).		Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Cals.
Pudding, rice custard, as purchased	1	. .	59.4	4.0	4.6	31.4	. .	0.6	825
Pudding, tapioca, as purchased	3	. .	64.5	3.3	3.2	28.2	. .	0.8	720
Pudding, tapioca, with apples, as purchased	1	. .	70.1	0.3	0.1	29.3	. .	0.2	575
SUGARS, STARCHES, ETC.									
Candy, as purchased	.	. .	. .	. .	. .	96.0	. .	. .	1785
Honey, as purchased	17	. .	18.2	0.4	. .	81.2	. .	0.2	1520
Molasses, cane, as purchased	15	. .	25.1	2.4	. .	69.3	. .	3.2	1290
Starch, arrowroot, as purch'd	1	. .	2.3	. .	. .	97.5	. .	0.2	1815
Starch, cornstarch, as purch'd	.	. .	. .	. .	. .	90.0	. .	. .	1675
Starch, manioca, as purch'd	1	. .	10.5	0.5	0.1	88.8	. .	0.1	1665
Starch, sago, as purchased	1	. .	12.2	9.0	0.4	78.1	. .	0.3	1635
Starch, tapioca, as purchased	7	. .	11.4	0.4	0.1	88.0	0.1	0.1	1650
Sugar, coffee or brown sugar, as purchased	328	. .	. .	. .	. .	95.0	. .	. .	1765
Sugar, granulated, as purchased	.	. .	. .	. .	. .	100.0	. .	. .	1860
Sugar, maple, as purchased	17	. .	. .	. .	. .	82.8	. .	. .	1540
Sugar, powdered, as purch'd	.	. .	. .	. .	. .	100.0	. .	. .	1860
Syrup, maple, as purchased	50	. .	. .	. .	. .	71.4	. .	. .	1330
VEGETABLES.[1]									
Artichokes, as purchased	2	. .	79.5	2.6	0.2	16.7	0.8	1.0	365
Asparagus, fresh, as purch'd	3	. .	94.0	1.8	0.2	3.3	0.8	0.7	105
Asparagus, cooked, as purchased	1	. .	91.6	2.1	3.3	2.2	. .	0.8	220
Beans, butter, green—									
Edible portion	1	. .	58.9	9.4	0.6	29.1	. .	2.0	740
As purchased	1	50.0	29.4	4.7	0.3	14.6	. .	1.0	370
Beans, dried, as purchased	11	. .	12.6	22.5	1.8	59.6	4.4	3.5	1605
Beans, frijoles (New Mexico), as purchased	4	. .	7.5	21.9	1.3	65.1	. .	4.2	1675
Beans, Lima, dried, as purchased	4	. .	10.4	18.1	1.5	65.9	. .	4.1	1625
Beans, Lima, fresh—									
Edible portion	1	. .	68.5	7.1	0.7	22.0	1.7	1.7	570
As purchased	.	55.0	30.8	3.2	0.3	9.9	0.8	0.8	255
Beans, mesquite, dry, as purchased	1	. .	4.8	12.2	2.5	77.1	. .	3.4	1765
Beans, string, cooked, edible portion	1	. .	95.3	0.8	1.1	1.9	. .	0.9	95
Beans, string, fresh—									
Edible portion	5	. .	89.2	2.3	0.3	7.4	1.9	0.8	195
As purchased	.	7.0	83.0	2.1	0.3	6.9	1.8	0.7	180
Beets, cooked, edible portion	1	. .	88.6	2.3	0.1	7.4	. .	1.6	185
Beets, fresh—									
Edible portion	24	. .	87.5	1.6	0.1	9.7	0.9	1.1	215
As purchased	.	20.0	70.0	1.3	0.1	7.7	. .	0.9	170
Cabbage—									
Edible portion	16	. .	91.5	1.6	0.3	5.6	1.1	1.0	145
As purchased	.	15.0	7.7	1.4	0.2	4.8	. .	0.9	125
Cabbage, curly, as purchased	1	. .	87.3	4.1	0.6	6.2	. .	1.8	215
Cabbage, sprouts—									
Edible portion	1	. .	88.2	4.7	1.1	4.3	. .	1.7	215
As purchased	1	61.8	33.7	1.8	0.4	1.7	. .	0.6	80

[1] Such vegetables as potatoes, squash, beets, etc., have a certain amount of inedible material, skin, seeds, etc. The amount varies with the method of preparing the vegetables, and can not be accurately estimated. The figures given for refuse of vegetables, fruits, etc., are assumed to represent approximately the amount of refuse in these foods as ordinarily prepared.

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
VEGETABLES (*Continued*).									
Carrots, fresh—		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Edible portion	18	. .	88.2	1.1	0.4	9.3	1.1	1.0	210
As purchased	.	20.0	70.6	0.9	0.2	7.4	. .	0.9	160
Carrots, evaporated, edible portion	1	. .	3.5	7.7	3.6	80.3	. .	4.9	1790
Cauliflower, as purchased . .	2	. .	92.3	1.8	0.5	4.7	1.0	0.7	140
Celery—									
Edible portion	5	.	94.5	1.1	0.1	3.3	. .	1.0	85
As purchased	.	20.0	75.6	0.9	0.1	2.6	. .	0.8	70
Collards—									
Edible portion	2	. .	87.1	4.5	0.6	6.3	. .	1.5	225
As purchased	1	55.3	39.5	1.5	0.2	2.9	. .	0.6	90
Corn, green—									
Edible portion	3	. .	75.4	3.1	1.1	19.7	0.5	0.7	470
As purchased	.	61.0	29.4	1.2	0.4	7.7	. .	0.3	180
Cucumbers—									
Edible portion	4	. .	95.4	0.8	0.2	3.1	0.7	0.5	80
As purchased	.	15.0	81.1	0.7	0.2	2.6	. .	0.4	70
Eggplant, edible portion . .	1	. .	92.9	1.2	0.3	5.1	0.8	0.5	130
Greens, beet, cooked, as purchased	1	. .	89.5	2.2	3.4	3.2	. .	1.7	245
Greens, dandelion, as purch'd	1	. .	81.4	2.4	1.0	10.6	. .	4.6	285
Greens, turnip-salad, as purchased	2	. .	86.7	4.2	0.6	6.3	. .	2.2	220
Kohl-rabi, edible portion . .	2	. .	91.1	2.0	0.1	5.5	1.2	1.3	145
Leeks—									
Edible portion	1	. .	91.8	1.2	0.5	5.8	. .	0.7	150
As purchased	1	15.0	78.0	1.0	0.4	5.0	0.6	0.6	130
Lentils, dried, as purchased .	3	. .	8.4	25.7	1.0	59.2	. .	5.7	1620
Lettuce—									
Edible portion	8	. .	94.7	1.2	0.3	2.9	0.7	0.9	90
As purchased	.	15.0	80.5	1.0	0.2	2.5	. .	0.8	75
Mushrooms, as purchased . .	11	. .	88.1	3.5	0.4	6.8	0.8	1.2	210
Okra—									
Edible portion	2	. .	90.2	1.6	0.2	7.4	3.4	0.6	175
As purchased	.	12.5	78.9	1.4	0.2	6.5	. .	0.5	155
Onions, fresh—									
Edible portion	15	. .	87.6	1.6	0.3	9.9	0.8	0.6	225
As purchased	.	10.0	78.9	1.4	0.3	8.9	. .	0.5	205
Onions, cooked, prepared, as purchased	1	. .	91.2	1.2	1.8	4.9	. .	0.9	190
Onions, green (New Mexico)—									
Edible portion	2	. .	87.1	1.0	0.1	11.2	. .	0.6	230
As purchased	.	51.0	42.6	0.5	0.1	5.5	. .	0.3	115
Parsnips—									
Edible portion	3	. .	83.0	1.6	0.5	13.5	2.5	1.4	300
As purchased	.	20.0	66.4	1.3	0.4	10.8	. .	1.1	240
Peas, dried, as purchased . .	8	. .	9.5	24.6	1.0	62.0	4.5	2.9	1655
Peas, green—									
Edible portion	5	. .	74.6	7.0	0.5	16.9	1.7	1.0	465
As purchased	.	45.0	40.8	3.6	0.2	9.8	. .	0.6	255
Peas, green, cooked, as purchased	1	. .	73.8	6.7	3.4	14.6	. .	1.5	540
Peas, sugar, green, edible portion	1	. .	81.8	3.4	0.4	13.7	1.6	0.7	335
Cowpeas, dried, as purchased	13	. .	13.0	21.4	1.4	60.8	4.1	3.4	1590
Cowpeas, green, edible port'n	1	. .	65.9	9.4	0.6	22.7	. .	1.4	620
Potatoes, raw or fresh—									
Edible portion	136	. .	78.3	2.2	0.1	18.4	0.4	1.0	385
As purchased	.	20.0	62.6	1.8	0.1	14.7	. .	0.8	310
Potatoes, evaporated, as purchased	3	. .	7.1	8.5	0.4	80.9	. .	3.1	1680
Pototoes, cooked, boiled, as purchased	11	. .	75.5	2.5	0.1	20.9	0.6	1.0	440

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
VEGETABLES (*Continued*).									
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Potatoes, cooked, chips, as purchased	2	. .	2.2	6.8	39.8	46.7	. .	4.5	2675
Potatoes, cooked, mashed and creamed, as purch'd	4	. .	75.1	2.6	3.0	17.8	. .	1.5	505
Potatoes, sweet, raw, or fresh—									
Edible portion	95	. .	69.0	1.8	0.7	27.4	1.3	1.1	570
As purchased	.	20.0	55.2	1.4	0.6	21.9	. .	0.9	460
Potatoes, sweet, cooked and prepared, as purchased .	1	. .	51.9	3.0	2.1	42.1	. .	0.9	925
Pumpkins—									
Edible portion	3	. .	93.1	1.0	0.1	5.2	1.2	0.6	120
As purchased	.	50.0	46.5	0.5	0.1	2.6	. .	0.3	60
Radishes—									
Edible portion	4	. .	91.8	1.3	0.1	5.8	0.7	1.0	135
As purchased	.	30.0	64.3	0.9	0.1	4.0	. .	0.7	95
Rhubarb—									
Edible portion	2	. .	94.4	0.6	0.7	3.6	1.1	0.7	105
As purchased	.	40.0	56.6	0.4	0.4	2.2	. .	0.4	65
Ruta-bagas—									
Edible portion	5	. .	88.9	1.3	0.2	8.5	1.2	1.1	190
As purchased	.	30.0	62.2	0.9	0.1	6.0	. .	0.8	135
Sauerkraut, as purchased . .	2	. .	88.8	1.7	0.5	3.8	. .	5.2	125
Spinach, fresh, as purchased	3	. .	92.3	2.1	0.3	3.2	0.9	2.1	110
Spinach, cooked, as purch'd	1	. .	89.8	2.1	4.1	2.6	. .	1.4	260
Squash—									
Edible portion	10	. .	88.3	1.4	0.5	9.0	0.8	0.8	215
As purchased	.	50.0	44.2	0.7	0.2	4.5	. .	0.4	105
Tomatoes, fresh, as purch'd .	27	. .	94.3	0.9	0.4	3.9	0.6	0.5	105
Tomatoes, dried, as purch'd .	1	. .	7.3	12.9	8.1	62.3	. .	9.4	1740
Turnips—									
Edible portion	19	. .	89.6	1.3	0.2	8.1	1.3	0.8	185
As purchased	1	30.0	62.7	0.9	0.1	5.7	. .	0.6	125
VEGETABLES, CANNED.									
Artichokes, as purchased . .	3	. .	92.5	0.8	. .	5.0	0.6	1.7	110
Asparagus, as purchased . .	14	. .	94.4	1.5	0.1	2.8	0.5	1.2	85
Beans, baked, as purchased .	21	. .	68.9	6.9	2.5	19.6	2.5	2.1	600
Beans, string, as purchased .	29	. .	93.7	1.1	0.1	3.8	0.5	1.3	95
Beans, little green, as purch'd	1	. .	93.8	1.2	0.1	3.4	0.6	1.5	90
Beans, wax, as purchased . .	1	. .	94.6	1.0	0.1	3.1	0.6	1.2	80
Beans, haricots verts, as purchased	7	. .	95.2	1.1	0.1	2.5	0.5	1.1	70
Beans, haricots flageolets, as purchased	3	. .	81.6	4.6	0.1	12.5	1.0	1.2	320
Beans, haricots panaches, as purchased	1	. .	86.1	3.7	. .	9.2	1.0	1.0	240
Beans, lima, as purchased .	16	. .	79.5	4.0	0.3	14.6	1.2	1.6	360
Beans, red kidney, as purch'd	1	. .	72.7	7.0	0.2	18.5	1.2	1.6	480
Brussels sprouts, as purch'd	1	. .	93.7	1.5	0.1	3.4	0.5	1.3	95
Corn, green, as purchased . .	52	. .	76.1	2.8	1.2	19.0	0.8	0.9	455
Corn and tomatoes, as purchased	2	. .	87.6	1.6	0.4	9.6	0.5	0.8	225
Macedoine (mixed vegetables), as purchased . . .	5	. .	93.1	1.4	. .	4.5	0.6	1.0	110
Okra, as purchased	4	. .	94.4	0.7	0.1	3.6	0.7	1.2	85
Okra and tomatoes, as purchased	3	. .	91.8	1.1	0.3	5.2	0.5	1.6	130
Peas, green, as purchased . .	88	. .	85.3	3.6	0.2	9.8	1.2	1.1	255
Potatoes, sweet, as purchased	2	. .	55.2	1.9	0.4	41.4	0.8	1.1	820
Pumpkins, as purchased . .	7	. .	91.6	0.8	0.2	6.7	1.1	0.7	150
Squash, as purchased	5	. .	87.6	0.9	0.5	10.5	0.7	0.5	235
Succotash, as purchased . .	12	. .	75.9	3.6	1.0	18.6	0.9	0.9	455
Tomatoes, as purchased . . .	19	. .	94.0	1.2	0.2	4.0	0.5	0.6	105

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
PICKLES, CONDIMENTS, ETC.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Catsup, tomato, as purchased	2	. .	82.8	1.5	0.2	12.3	. .	3.2	265
Horse-radish, as purchased .	2	. .	86.4	1.4	0.2	10.5	. .	1.5	230
Horse-radish, evaporated, as purchased	1	. .	4.3	11.0	0.8	77.7	.	6.2	1685
Olives, green—									
Edible portion	1	. .	58.0	1.1	27.6	11.6	. .	1.7	1400
As purchased	1	27.0	42.3	0.8	20.2	8.5	. .	1.2	1025
Olives, ripe—									
Edible portion	1	. .	64.7	1.7	25.9	4.3	. .	3.4	1205
As purchased	1	19.0	52.4	1.4	21.0	3.5	. .	2.7	975
Peppers (paprica), green, dried, as purchased . . .	1	. .	5.0	15.5	8.5	63.0	. .	8.0	1820
Peppers, red chili, as purch'd	5	. .	5.3	9.4	7.7	70.0	. .	7.6	1800
Pickles, cucumber, as purchased	3	. .	92.9	0.5	0.3	2.7	. .	3.6	70
Pickles, mixed, as purchased	1	. .	93.8	1.1	0.4	4.0	. .	0.7	110
Pickles, spiced, as purchased	1	. .	77.1	0.4	0.1	20.7	. .	1.7	395
FRUITS, BERRIES, ETC., FRESH.[1]									
Apples—									
Edible portion	29	. .	84.6	0.4	0.5	14.2	1.2	0.3	290
As purchased	.	25.0	63.3	0.3	0.3	10.8	. .	0.3	220
Apricots—									
Edible portion	11	. .	85.0	1.1	. .	13.4	. .	0.5	270
As purchased	.	6.0	70.9	1.0	. .	12.6	. .	0.5	255
Bananas, yellow—									
Edible portion	6	. .	75.3	1.3	0.6	22.0	1.0	0.8	460
As purchased	.	35.0	48.9	0.8	0.4	14.3	. .	0.6	300
Blackberries, as purchased .	9	. .	86.3	1.3	1.0	10.9	2.5	0.5	270
Cherries—									
Edible portion	16	. .	80.9	1.0	0.8	16.7	0.2	0.6	365
As purchased	.	5.0	76.8	0.9	0.8	15.9	. .	0.6	345
Cranberries, as purchased . .	3	. .	88.9	0.4	0.6	9.9	1.5	0.2	215
Currants, as purchased . . .	1	. .	85.0	1.5	. .	12.8	. .	0.7	265
Figs, fresh, as purchased, average	28	. .	79.1	1.5	. .	18.8	. .	0.6	380
Grapes—									
Edible portion	5	. .	77.4	1.3	1.6	19.2	4.3	0.5	450
As purchased	.	25.0	58.0	1.0	1.2	14.4	. .	0.4	335
Huckleberries, edible portion	1	. .	81.9	0.6	0.6	16.6	. .	0.3	345
Lemons—									
Edible portion	4	. .	89.3	1.0	0.7	8.5	1.1	0.5	205
As purchased	.	30.0	62.5	0.7	0.5	5.9	. .	0.4	145
Lemon-juice	22	. .	. .	. .	. .	9.8	. .	. .	180
Muskmelons—									
Edible portion	1	. .	89.5	0.6	. .	9.3	2.1	0.6	185
As purchased	1	50.0	44.8	0.3	. .	4.6	. .	0.3	90
Nectarines—									
Edible portion	1	. .	82.9	0.6	. .	15.9	. .	0.6	305
As purchased	1	6.6	77.4	0.6	. .	14.8	. .	0.6	285
Oranges—									
Edible portion	23	. .	86.9	0.8	0.2	11.6	. .	0.5	240
As purchased	.	27.0	63.4	0.6	0.1	8.5	. .	0.4	170
Peaches—									
Edible portion	2	. .	89.4	0.7	0.1	9.4	3.6	0.4	190
As purchased	2	18.0	73.3	0.5	0.1	7.7	. .	0.3	155

[1] Fruits contain a certain proportion of inedible materials, as skin, seeds, etc., which are properly classed as refuse. In some fruits, as oranges and prunes, the amount rejected in eating is practically the same as the refuse. In others, as apples and pears, more or less of the edible material is ordinarily rejected with the skin and seeds and other inedible portions. The edible material which is thus thrown away, and should properly be classed with the waste, is here classed with the refuse. The figures for refuse here given represent, as nearly as can be ascertained, the quantities ordinarily rejected.

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
FRUITS, BERRIES, ETC., FRESH (*Continued*).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Cals.*
Pears—									
Edible portion	2	. .	84.4	0.6	0.5	14.1	2.7	0.4	295
As purchased	.	10.0	76.0	0.5	0.4	12.7	. .	0.4	260
Persimmons, edible portion	1	. .	66.1	0.8	0.7	31.5	1.8	0.9	630
Pineapple, edible portion	1	. .	89.3	0.4	0.3	9.7	0.4	0.3	200
Plums—									
Edible portion	3	. .	78.4	1.0	. .	20.1	. .	0.5	395
As purchased	.	5.0	74.5	0.9	. .	19.1	. .	0.5	370
Pomegranates, edible portion	2	. .	76.8	1.5	1.6	19.5	2.7	0.6	460
Prunes—									
Edible portion	24	. .	79.6	0.9	. .	18.9	. .	0.6	370
As purchased	20	5.8	75.6	0.7	. .	17.4	. .	0.5	335
Raspberries, red, as purch'd	1	. .	85.8	1.0	. .	12.6	2.9	0.6	255
Raspberries, black, edible portion	3	. .	84.1	1.7	1.0	12.6	. .	0.6	310
Raspberry juice, edible portion	1	. .	49.3	0.5	. .	49.9	. .	0.3	935
Strawberries—									
Edible portion	22	. .	90.4	1.0	0.6	7.4	1.4	0.6	180
As purchased	.	5.0	85.9	0.9	0.6	7.0	. .	0.6	175
Watermelons—									
Edible portion	2	. .	92.4	0.4	0.2	6.7	. .	0.3	140
As purchased	.	59.4	37.5	0.2	0.1	2.7	. .	0.1	60
Whortleberries, as purchased	1	. .	82.4	0.7	3.0	13.5	3.2	0.4	390
FRUITS, ETC., DRIED.									
Apples, as purchased	3	. .	28.1	1.6	2.2	66.1	. .	2.0	1350
Apricots, as purchased	2	. .	29.4	4.7	1.0	62.5	. .	2.4	1290
Citron, as purchased	2	. .	19.0	0.5	1.5	78.1	. .	0.9	1525
Currants, Zante, as purch'd	4	. .	17.2	2.4	1.7	74.2	. .	4.5	1495
Dates—									
Edible portion	2	. .	15.4	2.1	2.8	78.4	. .	1.3	1615
As purchased	.	10.0	13.8	1.9	2.5	70.6	. .	1.2	1450
Figs, as purchased	3	. .	18.8	4.3	0.3	74.2	. .	2.4	1475
Grapes, ground, as purchased	1	. .	34.8	2.8	0.6	60.5	3.7	1.2	1205
Pears, as purchased	1	. .	16.5	2.8	5.4	72.9	. .	2.4	1635
Prunes—									
Edible portion	15	. .	22.3	2.1	. .	73.3	. .	2.3	1400
As purchased	.	15.0	19.0	1.8	. .	62.2	. .	2.0	1190
Raisins—									
Edible portion	3	. .	14.6	2.6	3.3	76.1	. .	3.4	1605
As purchased	.	10.0	13.1	2.3	3.0	68.5	. .	3.1	1445
Raspberries, as purchased	1	. .	8.1	7.3	1.8	80.2	. .	2.6	1705
FRUITS, ETC., CANNED; AND JELLIES, PRESERVES, ETC.									
Apples, crab, as purchased	1	. .	42.4	0.3	2.4	54.4	. .	0.5	1120
Apple sauce, as purchased	1	. .	61.1	0.2	0.8	37.2	. .	0.7	730
Apricots, as purchased	1	. .	81.4	0.9	. .	17.3	. .	0.4	340
Apricot sauce, as purchased	1	. .	45.2	1.9	1.3	48.8	. .	2.8	1000
Blackberries, as purchased	1	. .	40.0	0.8	2.1	56.4	. .	0.7	1150
Blueberries, as purchased	3	. .	85.6	0.6	0.6	12.8	. .	0.4	275
Cherries, as purchased	1	. .	77.2	1.1	0.1	21.1	. .	0.5	415
Cherry jelly—									
1st quality as purchased	1	. .	21.0	1.1	. .	77.2	. .	0.7	1455
2d quality, as purchased	1	. .	38.4	1.2	. .	59.8	. .	0.6	1135
Figs, stewed, as purchased	1	. .	56.5	1.2	0.3	40.9	. .	1.1	785
Grape butter, as purchased	1	. .	36.7	1.2	0.1	58.5	. .	3.5	1115
Marmalade (orange peel), as purchased	1	. .	14.5	0.6	0.1	84.5	. .	0.3	1585
Peaches, as purchased	3	. .	88.1	0.7	0.1	10.8	. .	0.3	220
Pears, as purchased	4	. .	81.1	0.3	0.3	18.0	. .	0.3	355
Pineapples, as purchased	1	. .	61.8	0.4	0.7	36.4	. .	0.7	715
Prune sauce, as purchased	1	. .	76.6	0.5	0.1	22.3	. .	0.5	430

Food materials.	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
FRUITS, ETC., CANNED; AND JELLIES, PRESERVES, ETC. (*Continued*).		Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Cals.
Strawberries, stewed, as purchased	1	. .	74.8	0.7	. .	24.0	. .	0.5	460
Tomato preserves, as purch'd	1	. .	40.9	0.7	0.1	57.6	. .	0.7	1090
NUTS.									
Almonds—									
Edible portion	11	. .	4.8	21.0	54.9	17.3	2.0	2.0	3030
As purchased	.	45.0	2.7	11.5	30.2	9.5	. .	1.1	1660
Beechnuts—									
Edible portion	1	. .	4.0	21.9	57.4	13.2	. .	3.5	3075
As purchased	1	40.8	2.3	13.0	34.0	7.8	. .	2.1	1820
"Biotes" (acorns) (*Quercus emoryi*)—									
Edible portion	1	. .	4.1	8.1	37.4	48.0	. .	2.4	2620
As purchased	1	35.6	2.6	5.2	24.1	30.9	. .	1.6	1690
Brazil nuts (*Bertholletia excelsa*)—									
Edible portion	1	. .	5.3	17.0	66.8	7.0	. .	3.9	3265
As purchased	1	49.6	2.6	8.6	33.7	3.5	. .	2.0	1655
Butternuts (*Jaglans cinerea*)—									
Edible portion	1	. .	4.4	27.9	61.2	3.5	. .	2.0	3165
As purchased	1	86.4	0.6	3.8	8.3	0.5	. .	0.4	430
Chestnuts, fresh—									
Edible portion	9	. .	45.0	6.2	5.4	42.1	1.8	1.3	1125
As purchased	9	16.0	37.8	5.2	4.5	35.4	. .	1.1	945
Chestnuts, dried—									
Edible portion	8	. .	5.9	10.7	7.0	74.2	2.7	2.2	1875
As purchased	8	24.0	4.5	8.1	5.3	56.4	. .	1.7	1425
Cocoanuts—									
Edible portion	1	. .	14.1	5.7	50.6	27.9	. .	1.7	2760
As purchased	1	48.8	7.2	2.9	25.9	14.3	. .	0.9	1413
Cocoanut, without milk, as purchased	1	37.3	8.9	3.6	31.7	17.5	. .	1.0	1730
Cocoanut-milk, as purchased	1	. .	92.7	0.4	1.5	4.6	. .	0.8	155
Cocoanut, prepared, as purchased	2	. .	3.5	6.3	57.4	31.5	. .	1.3	3125
Filberts—									
Edible portion	1	. .	3.7	15.6	65.3	13.0	. .	2.4	3290
As purchased	1	52.1	1.8	7.5	31.3	6.2	. .	1.1	1575
Hickory nuts—									
Edible portion	1	. .	3.7	15.4	67.4	11.4	. .	2.1	3345
As purchased	1	62.2	1.4	5.8	25.5	4.3	. .	0.8	1265
Lichi nuts—									
Edible portion	1	. .	17.9	2.9	0.2	77.5	. .	1.5	1505
As purchased	1	41.6	10.5	1.7	0.1	45.2	. .	0.9	875
Peanuts—									
Edible portion	4	. .	9.2	25.8	38.6	24.4	2.5	2.0	2560
As purchased	.	24.5	6.9	19.5	29.1	18.5	. .	1.5	1935
Peanut butter, as purchased	2	. .	2.1	29.3	46.5	17.1	. .	5.0	2825
Pecans, polished—									
Edible portion	1	. .	3.0	11.0	71.2	13.3	. .	1.5	3455
As purchased	1	53.2	1.4	5.2	33.3	6.2	. .	0.7	1620
Pecans, unpolished—									
Edible portion	1	. .	2.7	9.6	70.5	15.3	. .	1.9	3435
As purchased	1	46.3	1.5	5.1	37.9	8.2	. .	1.0	1846
Pine nuts—									
Pignolias, edible portion	1	. .	6.4	33.9	49.4	6.9	. .	3.4	2845
Piniones (*Pinus monophylla*)—									
Edible portion	1	. .	3.8	6.5	60.7	26.2	. .	2.8	3170
As purchased	1	41.7	2.2	3.8	35.4	15.3	. .	1.6	1850
Piñon (*Pinus edulis*)—									
Edible portion	1	. .	3.4	14.6	61.9	17.3	. .	2.8	3205
As purchased	1	40.6	2.0	8.7	36.8	10.2	. .	1.7	1905

Food materials	Number of analyses.	Refuse.	Water.	Protein.	Fat.	Total carbohydrates (including fiber).	Fiber.	Ash.	Fuel-value per pound.
VEGETABLE FOOD (*Continued*).									
NUTS (*Continued*).									
Pine nuts (*Continued*)—									
Sabine pine nut (*Pinus sabiniana*)—		Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Cals.
Edible portion	1	. .	5.1	28.1	53.7	8.4	. .	4.7	2945
As purchased	1	77.0	1.2	6.5	12.3	1.9	. .	1.1	675
Pistachios—									
First quality, shelled, edible portion	1	. .	4.2	22.3	54.0	16.3	. .	3.2	2995
Second quality, shelled, edible portion	1	. .	4.3	22.8	54.9	14.9	. .	3.0	3020
Walnuts, California—									
Edible portion	1	. .	2.5	18.4	64.4	13.0	1.4	1.7	3380
As purchased	1	73.1	0.7	4.9	17.3	3.5	. .	0.5	885
Walnuts, California, black—									
Edible portion	2	. .	2.5	27.6	56.3	11.7	1.7	1.9	3105
As purchased	.	74.1	0.6	7.2	14.6	3.0	. .	0.5	805
Walnuts, California, soft shell—									
Edible portion	4	. .	2.5	16.6	63.4	16.1	2.6	1.4	3285
As purchased	:	58.1	1.0	6.9	26.6	6.8	. .	0.6	1375
"Malted nuts," as purchased	1	. .	2.6	23.7	27.6	43.9	. .	2.2	2240
MISCELLANEOUS.									
Chocolate, as purchased . . .	2	. .	5.9	12.9	48.7	30.3	. .	2.2	2860
Cocoa, as purchased	3	. .	4.6	21.6	28.9	37.7	. .	7.2	2320
Cereal coffee infusion (1 part boiled in 20 parts water) .	5	. .	98.2	0.2	. .	1.4	. .	0.2	30
Yeast, compressed, as purchased	1	. .	65.1	11.7	0.4	21.0	. .	1.8	625

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
UNCLASSIFIED FOOD MATERIALS.									
ANIMAL AND VEGETABLE.									
Soups, home-made.		Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Per ct.	Cals.
Beef soup, as purchased . . .	2	. .	92.9	4.4	. .	0.4	1.1	1.2	120
Bean soup, as purchased . . .	1	. .	84.3	3.2	. .	1.4	9.4	1.7	295
Chicken soup, as purchased	1	. .	84.3	10.5	. .	0.8	2.4	2.0	275
Clam chowder, as purchased	2	. .	88.7	1.8	. .	0.8	6.7	2.0	195
Meat stew, as purchased . .	5	. .	84.5	4.6	. .	4.3	5.5	1.1	370
Soups, canned.									
Asparagus, cream of, as purchased	1	. .	87.4	2.5	. .	3.2	5.5	1.4	285
Bouillon, as purchased . . .	3	. .	96.6	2.2	. .	0.1	0.2	0.9	50
Celery, cream of, as purch'd	1	. .	88.6	2.1	. .	2.8	5.0	1.5	250
Chicken gumbo, as purch'd .	2	. .	89.2	3.8	. .	0.9	4.7	1.4	195
Chicken soup, as purchased	2	. .	93.8	3.6	. .	0.1	1.5	1.0	100
Consommé, as purchased .	1	. .	96.0	2.5	. .	. .	0.4	1.1	55
Cream, corn of, as purchased	1	. .	86.8	2.5	. .	1.9	7.8	1.0	270
Julienne, as purchased . . .	1	. .	95.9	2.7	. .	. .	0.5	0.9	60
Mock turtle, as purchased . .	2	. .	89.8	5.2	. .	0.9	2.8	1.3	185
Mulligatawny, as purchased	2	. .	89.3	3.7	. .	0.1	5.7	1.2	180

Food materials.	Number of analyses.	Refuse.	Water.	Protein. N × 6.25.	Protein. By difference.	Fat.	Total carbohydrates.	Ash.	Fuel-value per pound.
UNCLASSIFIED FOOD MATERIALS (*Continued*).									
ANIMAL AND VEGETABLE (*Continued*).									
Soups, canned (Continued).		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Oxtail—									
Edible portion	2	. .	88.8	4.0	. .	1.3	4.3	1.6	210
As purchased	1	1.8	87.8	3.8	. .	0.5	4.2	1.9	170
Pea soup, as purchased	4	. .	86.9	3.6	. .	0.7	7.6	1.2	235
Pea, cream of green, as purchased	1	. .	87.7	2.6	. .	2.7	5.7	1.3	270
Tomato soup, as purchased	2	. .	90.0	1.8	. .	1.1	5.6	1.5	185
Turtle, green, as purchased	1	. .	86.6	6.1	. .	1.9	3.9	1.5	265
Vegetable, as purchased	1	. .	95.7	2.9	. .	. .	0.5	0.9	65
Miscellaneous.									
Hash, as purchased	1	. .	80.3	6.0	. .	1.9	9.4	2.4	365
"Infants' and invalids' foods," as purchased[1]	22	. .	6.0	12.7	. .	3.3	76.2	1.8	1795
Mincemeat, commercial, as purchased	3	. .	27.7	6.7	. .	1.4	60.2	4.0	1305
Mincemeat, home-made, as purchased	3	. .	54.4	4.8	. .	6.7	32.1	2.0	970
Salad, ham, as purchased	1	. .	69.4	15.4	. .	7.6	5.6	2.0	710
Sandwich, egg, as purchased	1	. .	41.4	9.6	. .	12.7	34.5	1.8	1355
Sandwich, chicken, as purchased	1	. .	48.5	12.3	. .	5.4	32.1	1.7	1055

[1] This includes malted milk, infants' foods, and similar preparations which are sold under various trade names, but are similar in composition.

RAPID REFERENCE DIET-LISTS

These lists have been inserted to enable the practitioner to make rapid reference when so desired. Additional lists will be found under the headings of the various diseases. Additions and changes may be made to suit the individual patient. It is convenient to have a printed form containing a list of the foods usually allowable and those usually forbidden. With such a form a diet may be easily prescribed by marking off all articles which are not thought desirable. The following is a useful list:

All foods are allowable unless marked off the list.

Soups.

Bouillon,
Beef broth,
Veal broth,
Mutton broth,
Chicken broth.

Thick Soups.

Mock turtle,
Mulligatawney,
Fish soups.
Noodle,
Vegetable,
Julienne.

Purees and Creams.

Barley,
Rice,
Pea,
Bean,
Asparagus,
Potato,
Tomato,
Celery,
Onion.

Fish.

Boiled,
Broiled,
Baked,
Bass,
Bluefish,
Carp,
Cod,
Flounder,
Haddock,
Halibut,
Herring,
Mackerel,
Perch,
Pickerel,
Pompano,
Salmon,
Shad,
Shad roe,
Trout,
Turbot.

Oysters.

Raw,
Panned,
Broiled,
Steamed,
Stewed,
Oyster pate,
Roast.

Clams.

Raw,
Broth,
Chowder.

Shellfish, etc.

Crabs,
Lobster,
Frogs,
Shrimp,
Terrapin,
Green turtle.

Meats.

Boiled,
Broiled,
Hashed,
Roast,
Stewed,
Beef,
Raw beef,
Beefsteak,
Mutton,
Mutton chops,
Lamb,
Lamb chops,
Veal,
Pork,
Bacon,
Ham,
Sausage,
Tongue,
Brains,
Sweetbreads,
Liver,
Kidney,
Tripe.

Poultry.

Chicken,
Turkey,
Duck,
Goose,
Squab.

Game.

Partridge,
Wild duck,
Rabbit,
Squirrel,
Venison.

Eggs.

Raw,
Soft boiled,
Poached,
Omelet,
Scrambled.

Milk.

Whole,
Skimmed,
Peptonized,
Buttermilk,
Whey,
Curd,
Kumiss,
Kefir,
Matzoon,
Cream,
Boiled milk,
Pasteurized milk,
Milk and barley-water.

Butter.

Cheese.

Cream,

American,
Cheshire.
Cheddar,
Pineapple,
Sweitzer,
Roquefort,
Camembert.

Cereals, etc.

Oatmeal,
Cracked wheat,
Rice,
Barley,
Farina,
Corn meal,
Hominy,
Buckwheat,
Cereal gruels,
Sago,
Tapioca,
Macaroni,
Spaghetti.

Legumes.

Peas,
Beans,
Lima beans,
Green beans,
Navy beans,
Lentils.

Roots and Tubers.

Potatoes,
Baked,
Boiled,
Mashed,
Sweet potatoes,
Jerusalem artichoke,
Beets,
Carrots,
Parsnips,
Turnips.

Green Vegetables.

Cabbage,
Cauliflower,
Brussel sprouts,
Sauer kraut,
Spinach,
Vegetable marrow,
Sea kale,
Tomatoes,
Lettuce,
Endives,
Sorrel,
Chicory,
Watercress,
Asparagus,
Salsify,
Rhubarb,
Celery,
Squash,
Green corn.

Fruit.

Raw,
Stewed,
Oranges,
Lemons,
Apples,
Pears,
Peaches,
Bananas,
Grapes,
Plums,
Prunes,
Cherries,
Olives,
Pine apples,
Melons,
Dates,
Figs,
Berries.

Nuts.

Breads.

Stale,
Toasted,
Pulled,
Zwieback.
White flour,
Graham flour,
Rye,
Crackers,
Gluten bread,

Desserts.

Puddings,
Bread,
Cornstarch,
Blanc mange,
Rice,
Tapioca,
Junket,
Cup custard,

Ice Cream.

Vanilla,
Chocolate,
Fruit flavors.

Water Ices.

Lemon,
Orange,
Sherbet.

Cakes.

Sponge cake,
Lemon jelly,
Wine jelly,
Honey.

Beverages.

Egg-nog,
Egg broth,
Albumin water,
Lemonade,
Imperial drink,
Flaxseed tea,
Grape juice,
Oatmeal,
Barley water,
Rice water,
Tea,
Coffee,
Chocolate,
Cocoa.

Mineral Waters.

Vichy,
Lithia water,
Appollinaris,
White Rock,
Poland,
Congress,
Hathorne,
Carlsbad.

Alcoholic Beverages.

According to special directions.

It is frequently found advisable to have a list of the articles of diet most frequently forbidden. The following will be found useful:

Rich soups,
Fried foods,
Pork,
Veal,
Stews,
Hashes,
Corned meats,
Potted meats,
Liver,
Kidney,
Duck,
Goose,
Sausage,
Twice-cooked meats,
Crabs,
Preserved fish,
Smoked fish,
Salted fish,
Salmon,
Salt mackerel,
Sardines,
Cauliflower,
Celery,
Radishes,
Cabbage,
Sweet potatoes,
Beets,
Salads,
Hot bread,
Hot cakes,
Nuts,
Candies,
Pies,
Pastries,
Preserves,
Strong tea,
Strong coffee,
Alcoholic stimulants,
Iced water,
Ice cream.

FEVER

General Directions.—As a rule, the food should be fluid and given at regular intervals in small quantities.

May take:

Milk.—Milk and barley water, malted milk, peptonized milk, kumiss, kefir, buttermilk, egg-nog (small quantity), milk punch, milk Vichy.

Soups.—Clam broth, oyster broth, chicken, mutton or beef broth, beef juice, beef-tea, bouillon with egg, liquid beef preparations, as panopepton, liquid beef peptonoids, tonic beef, and the like. These should be diluted with water.

Eggs.—Albumin water with flavoring of orange or lemon juice, with wine as sherry or other stimulants.

Drinks.—Water, lemonade, orangeade, grape juice, barley water, rice water, Vichy, Apollinaris, Poland White Rock.

DYSPEPSIA AND CHRONIC GASTRITIS

May take:

Soups.—Mutton, chicken, beef, oyster, bouillon, rice, tapioca, barley, vermicelli, clam.

Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped, boiled, or broiled beef, broiled steak, roast beef or mutton, broiled chops, roast lamb, lamb chops, boiled, broiled, or roasted chicken, squab, turkey, birds.

Fish.—Raw, broiled, or stewed oysters, boiled or broiled mackerel, rock, bass, trout, or blue-fish.

Eggs.—Raw, soft boiled, poached.

Vegetables.—Asparagus, spinach, peas, string beans, lima beans, (best mashed and strained) potatoes (baked or mashed), turnips, carrots (mashed and strained), lettuce (without vinegar), cresses (without vinegar).

Farinaceous Food.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, graham bread, corn bread, pulled bread, zwieback.

Desserts.—Blanc-mange, hominy, custards, rice pudding, tapioca pudding, bread pudding.

Fruits.—Lemons, oranges, raw, baked, or stewed apples, grapes, stewed apricots, raw, or stewed, peaches, stewed pears, stewed prunes, stewed cherries.

Fatty Foods.—Butter, cream, pure olive oil.

Drinks.—Taken mainly between meals. Milk, buttermilk, malted milk, peptonized milk, milk with lime-water, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, cocoa, albumin-water, hot water, grape juice.

Mineral Waters.—Vichy, Apollinaris, Poland, Lithia water, Congress, Hathorne, Carlsbad.

Must not take:

Rich soups, fried foods, pork, veal, stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salted fish, salmon, salt mackerel, sardines, celery, corn, radish, cabbage, tomatoes, cucumbers, sweet potatoes, beets, salads, hot bread or cakes, nuts, candies, pies, pastry, cheese, strong tea, strong coffee, alcoholic stimulants, ice-water, ice-cream.

DILATATION OF THE STOMACH

May take:

Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped beef, broiled steak, roast beef, roast lamb, chops, boiled, broiled, or roasted chicken, broiled or roasted squab, birds or turkey.

Fish.—Raw, broiled or stewed oysters, broiled or boiled mackerel, rock, bass, trout, or blue-fish.

Eggs.—Raw, soft-boiled, poached.

Vegetables.—Asparagus, spinach, peas, string beans, lima beans (best mashed and strained), potatoes (baked or mashed), turnips, carrots (mashed and strained), lettuce (without vinegar), cresses (without vinegar).

Farinaceous Food.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, toasted crackers, corn bread, pulled bread, zwieback.

Desserts.—Blanc-mange, custards.

Fruits.—Baked or stewed apples, stewed prunes.

Fatty Foods.—Butter (small quantity), cream.

Drinks.—Take mainly between meals. Milk, malted milk, peptonized milk, milk flavored with tea, milk flavored with coffee, albumin-water, water (not with meals).

Must not take:

Soups, fried foods, pork, veal, stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salted fish, salmon, salt mackerel, sardines, cauliflower, celery, radishes, corn, cabbage, cucumber, tomatoes, sweet potatoes, beets, salads, hot bread or cakes, nuts, candies, pies, pastry, cheese, strong tea, strong coffee, alcoholic stimulants, ice-water, ice-cream.

ATONY OF THE STOMACH

May take:

Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped, boiled or broiled beef, broiled steak, roasted mutton, broiled chops, roast lamb, boiled, broiled or roasted chicken, broiled or roasted squab, roast turkey, broiled or roast birds.

Fish.—Raw, broiled, or stewed oysters, broiled or boiled mackerel, rock, bass, trout or blue-fish.

Eggs.—Raw, soft-boiled, or poached.

Vegetables.—Asparagus, spinach, peas, string beans, lima beans (best mashed and strained), potatoes (baked or mashed), turnips, carrots, lettuce (without vinegar), cresses (without vinegar).

Farinaceous Foods.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, graham bread, corn bread, pulled bread, zwieback.

Desserts.—Blanc-mange, honey, custards, rice pudding, tapioca pudding, bread pudding.

Fruits.—Lemons, oranges, raw (scraped), baked or stewed apples, grapes, stewed apricots, raw or stewed peaches, stewed pears, stewed prunes, figs.

Fatty Foods.—Butter, cream.

Drinks.—Taken mainly between meals. Milk, buttermilk, malted milk, peptonized milk, milk with lime-water, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, cocoa, albumin-water, water (not with meals), hot water, grape juice.

Must not take:

Soups, fried foods, pork, veal stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salmon, salt mackerel, sardines, cauliflower, celery, radishes, cabbage, cucumber, sweet potatoes, beets, salads, hot bread or cakes, nuts, candies, pies, pastry, cheese, strong tea, strong coffee, alcoholic stimulants, ice-water, ice-cream.

HYPERCHLORHYDRIA OR HYPERACIDITY

May take:

Meats.—Boiled or broiled brains, raw scraped beef, boiled or broiled beef, broiled steak, roast mutton, broiled chops, roast lamb, boiled, broiled or roasted chicken, broiled or roasted squab, roast turkey, broiled or roasted birds.

Farinaceous Foods.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, corn bread, pulled bread, zwieback.

Fruits.—Baked or stewed apples, stewed apricots, stewed peaches, stewed pears, stewed prunes.
Fatty Foods.—Butter, cream, pure olive oil.
Drinks.—Taken mainly between meals. Milk, buttermilk, malted milk, peptonized milk, milk with lime-water, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, cocoa, albumin-water, water (not with meals), hot water.
Mineral Waters.—Vichy, Apollinaris, Poland, Lithia water, Congress, Hathorne, Carlsbad.

Must not take:

Soups, fried foods, pork, veal, stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salmon, salt mackerel, sardines, cauliflower, celery, cocoa, radishes, cucumbers, sweet potatoes, beets, tomatoes, acid fruits, salads, hot bread or cakes, nuts, candies, pies, pastry, cheese, strong tea, strong coffee, alcoholic stimulants, ice-water, ice-cream.

ULCER OF THE STOMACH

FIRST WEEK.—Broth, mutton, chicken, beef, oysters, bouillon, flour.
Eggs.—Raw or in bouillon.
Drinks.—Milk with Vichy, milk with lime-water.
SECOND WEEK.—**Broths.**—Mutton, chicken, beef, oyster, bouillon, flour, rice, barley.
Eggs.—Raw or in bouillon, soft-boiled.
Drinks.—Milk with Vichy or lime-water.
Farinaceous Foods.—Bread, milk-toast, rice served in milk or bouillon, tapioca served in milk or bouillon.
THIRD WEEK.—**Broths.**—Mutton, chicken, beef, oyster, bouillon, tapioca, rice, barley, clam, vermicelli.
Meats.—Brains boiled, sweetbreads boiled, broiled, beef raw, scraped, broiled steak, lamb chops, chicken, boiled, broiled, squab broiled.
Fish.—Raw, broiled, or stewed oysters, boiled rock or bass.
Eggs.—Raw, soft boiled.
Farinaceous Foods.—Rice, cornstarch, sago, tapioca, arrowroot, grits, cream of wheat, toast, zwieback.
Fatty Foods.—Butter.
Drinks.—Milk, malted milk, peptonized milk, milk with Vichy, milk with lime-water, milk with tea, milk in coffee, kefir, kumiss, junket, whey, cocoa, albumin-water, Apollinaris.

FOURTH WEEK.

May take:

Soups.—Mutton, chicken, beef, oyster, bouillon, rice, tapioca, barley, vermicelli, clam.
Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped, boiled or broiled beef, broiled steak, roast beef, roast mutton, broiled mutton chops, roast lamb, lamb chops, boiled, broiled, or roasted chicken, broiled or roasted squab or other birds.
Fish.—Raw, broiled, or stewed oysters, broiled or boiled mackerel, rock, bass, trout or blue-fish.
Eggs.—Raw, soft-boiled, poached.
Vegetables.—Asparagus, spinach, peas (mashed and strained), potatoes (baked or mashed), turnips, carrots (mashed and strained).
Farinaceous Foods.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, corn bread, pulled bread, zwieback.
Desserts.—Blanc-mange, custards, rice pudding, tapioca pudding, bread pudding.
Fatty Foods.—Butter, cream, pure olive oil.
Drinks.—Milk, buttermilk, malted milk, peptonized milk, milk with lime-water, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, cocoa, albumin-water, water (not with meals),

hot water, grape juice. *Mineral waters.*—Vichy, Apollinaris, Poland, Carlsbad.

CHRONIC DIARRHEA

May take:

Soups.—Mutton, chicken, oyster, bouillon, rice, tapioca, barley, vermicelli, clam.

Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped beef, broiled steak, roast, broiled mutton chops, lamb chops, boiled or broiled chicken, broiled squab, roast turkey, broiled birds.

Fish.—Raw, broiled, or stewed oysters, broiled or boiled mackerel, rock, bass, trout or blue-fish.

Eggs.—Raw, soft-boiled, poached.

Vegetables.—Asparagus, spinach, peas (mashed and strained), potatoes (baked or mashed).

Farinaceous Foods.—Rice, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, pulled bread, zwieback.

Desserts.—Blanc-mange, custards, rice pudding, tapioca pudding, bread pudding.

Fatty Foods.—Butter (small quantity).

Drinks.—Milk (boiled), malted milk, peptonized milk, milk with lime-water, milk flavored with tea, junket, whey, cocoa (Acorn), albumin-water, water (not with meals).

Alcoholic Stimulants.—Port wine, brandy at times.

Must not take:

Rich soups, fried foods, pork, veal, stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salted fish, salmon, salt mackerel, sardines, cauliflower, celery, radishes, tomatoes, cabbage, corn, cucumbers, sweet potatoes, beets, salads, hot bread or cakes, nuts, candies, pies, pastry, cheese, strong tea, strong coffee, alcoholic stimulants, ice-water, ice-cream, oatmeal, graham bread, fruits.

CHRONIC CONSTIPATION

May take:

Soups.—Mutton, chicken, beef, oyster, bouillon, rice, tapioca, barley, vermicelli, clam.

Meats.—Boiled brains, boiled or broiled sweetbreads, raw scraped, boiled, or broiled beef, broiled steak, roast beef, roast mutton, broiled mutton chops, roast lamb, lamb chops, boiled, broiled, or roasted chicken, broiled or roast squab, roast turkey, broiled birds.

Fish.—Raw, broiled, stewed, or panned oysters, broiled, boiled, or baked mackerel, rock, bass, trout, blue-fish, eggs.

Vegetables.—Asparagus, boiled onions, celery, spinach, peas, corn, string beans, lima beans, tomatoes, potatoes, sweet potatoes, turnips, carrots, cauliflower, lettuce, cresses, sauer-kraut.

Farinaceous Foods.—Oatmeal, cornstarch, sago, tapioca, hominy, grits, vermicelli, cream of wheat, wheat bread, graham bread, corn bread, brown bread, rye bread.

Desserts.—Ice cream, blanc-mange, honey, syrup, custards, rice pudding, tapioca pudding, bread pudding.

Fruits.—Lemons, oranges, raw, baked or stewed apples, grapes, apricots, raw or stewed peaches, stewed pears, prunes, or cherries, figs.

Fatty Foods.—Butter, cream, pure olive oil.

Drinks.—Taken mainly between meals. Milk, buttermilk, malted milk, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, albumin-water, water (not with meals), hot water, grape juice, cider. *Mineral Waters.*—Vichy, Apollinaris, Poland, Lithia water, Congress, Hathorne, Carlsbad.

Must not take:

Tea, claret, cocoa, chocolate, rice, barley or farina gruels, huckleberries, cheese, alcoholic stimulants.

DEBILITY AND ANEMIA

May take:

Thickened Soups.—Mutton, chicken, beef, oyster, bouillon, rice, tapioca, barley, vermicelli, vegetable.

Meats.—Raw scraped beef, chopped, boiled, or rare broiled steak, rare roast beef, roast mutton, broiled chops, roast lamb, lamb chops, boiled, broiled, or roast chicken, broiled or roasted squab.

Fish.—Raw, broiled, or stewed oysters, broiled or boiled mackerel, rock, bass, trout or blue-fish.

Eggs.—Raw and with sherry, soft boiled, poached, scrambled.

Vegetables.—Asparagus, spinach, peas, string beans, lima beans, potatoes (baked or mashed), tomatoes, raw, lettuce (without vinegar), cresses (without vinegar), celery, onions.

Farinaceous Foods.—Rice, cornstarch, sago, tapioca, arrowroot, mush, hominy, rolled oats, grits, cakes, vermicelli, macaroni, cream of wheat, pulled bread, zwieback, brown bread.

Desserts.—Blanc-mange, honey, jellies and jams, custards, marmalades, rice pudding, tapioca pudding, bread pudding, calf's-foot jelly.

Fruits.—Lemons, oranges, raw, baked, or stewed apples, grapes, raw or stewed apricots, raw or stewed peaches, raw or stewed pears, stewed prunes, raw or stewed cherries, figs.

Fatty Foods.—Butter, cream, pure olive oil, cod liver oil.

Drinks.—Milk, buttermilk, malted milk, peptonized milk, milk with lime-water, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, chocolate (vigor), albumin-water, water (not with meals), grape juice, malt extract. *Mineral Waters.*—Vichy, Apollinaris, Poland, White Rock.

Must not take:

Thin soups, pork, veal, stews, hashes, corned meat, turkey, sausage, cabbage, turnips, cucumbers, carrots, sweet potatoes, pickles, salads, bananas, candies, pies, pastry, strong teas, strong coffee, alcoholic stimulants.

OBESITY

General Directions.—Avoid sugars and starchy foods and take little or no fatty food. Eat sparingly and take but little fluid, and that, apart from meals.

May take:

Soups (small quantity).—Chicken, beef, oyster, bouillon, clam.

Meats.—Once daily, lean raw scraped, boiled, broiled beef, broiled steak or roast beef, roast mutton, broiled chops, roast lamb or lamb chops, boiled or broiled chicken.

Fish.—Oysters, raw, boiled mackerel, boiled rock, boiled trout.

Eggs.—Soft-boiled, poached.

Vegetables (best mashed and strained).—Asparagus, spinach, peas, string beans, lima beans, tomatoes, cabbage, cauliflower, lettuce, cresses, celery, onions, radishes, olives.

Farinaceous Foods.—Stale wheat bread (small quantity), zwieback, toast (small qnantity), graham bread, gluten bread (small quantity).

Fruits (acid).—Lemons, oranges, raw apples, grapes, raw peaches, cherries, berries.

Drinks.—Water (not with meals), hot water, tea (no sugar or milk), coffee (no sugar or milk). *Mineral Waters.*—Vichy, Lithia water, Rubinat, Apenta, Carlsbad.

Must not take:

Rich soups, fried foods, pork, veal, stews, hashes, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salted fish, salmon, bluefish, salt mackerel, herring, hominy, oatmeal, rice puddings, sardines, celery, potatoes, turnips, carrots, parsnips, sweet

potatoes, beets, hot bread or cakes, nuts, candies, pies, pastry, alcoholic stimulants.

DIABETES

General Directions.—Eat meats, eggs, green vegetables, and fatty foods, and avoid sugars, starchy foods, and liver.

May take:

Soups.—Chicken, beef, veal, mutton, oyster, turtle, terrapin, clam broth (no flour).

Meats.—All kinds except liver. Gelatin jellies.

Cheese.—All kinds of cheese, especially cream cheese.

Fish.—All kinds of fish and in any form, oysters, clams, terrapin, lobster, shrimp, salt fish, unless they cause too great thirst.

Farinaceous Foods.—Gluten bread, cakes, biscuit and porridges, almond cakes and bread, Soya bread.

Vegetables.—Green vegetables, spinach, lettuce, romaine, chicory, sorrel, kale, artichokes, endives, pickles, cucumbers, cranberries, truffles, mushrooms.

Vegetables sometimes allowable.—Green string beans, cauliflower, cabbage, sauer-kraut, slaw, egg-plant, vegetable marrow, asparagus, onions.

Fruits.—Acid fruits of any kind, sour apples, sour cherries, sour oranges, lemons, grape-fruit, goose-berries, red currants.

Nuts.—All sorts of oily nuts, as cocoanut, walnuts, filberts, almonds, butternuts, pecans, Brazil nuts.

Fatty Foods.—Cream, butter, olive oil, cod liver oil, bone marrow.

Drinks.—Tea or coffee without sugar, alkaline mineral waters, Rhine wines, claret, Burgundy, brandy, whiskey.

Allowable at Times under Special Directions.—Milk, bread, potatoes, and oatmeal. (See Diet cures in Diabetes.)

Must not take:

All sweet foods, sugars, confections, and the like. All starchy food, as rice, hominy, and foods prepared with flour, etc.

Meats.—Liver, pâté de foie gras.

Vegetables.—Potatoes, turnips, beets, carrots, peas, beans (not always string beans), cauliflower, sweet fruits, dates, grapes, peaches, prunes, bananas, preserves, and jellies.

Nuts.—Peanuts, and chestnuts.

Beverages.—Sweet wines, cider, cordials, beers, porter.

GOUT AND GOUTINESS

General Directions.—Take moderate quantities of plain nutritious foods. Avoid excesses of meat, all rich foods, and eat only moderate quantities of starches and sugars.

May take:

Soups.—Meat soups in small quantities. Mutton (weak), chicken (weak), beef (weak), oyster, bouillon, rice, tapioca, barley, vermicelli, clam, vegetable.

Lean Meats.—Roast mutton chops, lamb chops, boiled, broiled, or roasted chicken, broiled or roasted squab, ham, bacon, broiled or roasted birds (once a day).

Fish.—Raw, broiled, or stewed oysters, boiled or broiled rock, bass, trout or bluefish.

Eggs.—In small quantity, coddled or soft boiled.

Vegetables.—Spinach, young peas, string beans, potatoes (baked, small quantity), turnips, cauliflower, cabbage, lettuce (without vinegar), celery, cresses (without vinegar), onions.

Farinaceous Foods.—Rice in small quantity, oatmeal, cornstarch, sago, tapioca, arrowroot, hominy, grits, vermicelli, cream of wheat, stale wheat bread, toast, graham bread, rye bread, corn bread, pulled bread, zwieback.

Desserts.—Blanc-mange (no sugar) custards (no sugar), rice pudding (no sugar), tapioca pudding (no sugar), bread pudding (no sugar), milk pudding.

Fruits.—Lemons, oranges, apples (tart) raw, baked or stewed, stewed apricots, raw or stewed peaches, stewed prunes, stewed cherries. Fruit to be stewed without sugar.

Fatty Foods.—Butter.

Drinks.—Taken mainly with meals. Milk, buttermilk, peptonized milk, milk with Vichy, milk flavored with tea, milk flavored with coffee, kefir, kumiss, junket, whey, lime juice or lemonade without sugar, water, hot water. *Mineral Waters.*—Vichy, Apollinaris, Poland, Lithia water, Carlsbad.

Must not take:

Rich soups, fried foods, hard-boiled eggs, pork, veal, stews, hashes, turkey, corned meat, potted meat, liver, kidney, duck, goose, sausage, crabs, lobsters, preserved fish, smoked fish, salted fish, salmon, salt mackerel, sardines, radishes, mushrooms, asparagus, tomatoes, dried beans, old peas, pickles, sweet potatoes, beets, hot bread or cakes, nuts, candies, preserves, pies, pastry, rich puddings, cheese, strong tea, strong coffee, alcoholic stimulants, sweet wines, ice-cream, stewed berries, cider.

ALBUMINURIA

May take:

Soups.—Milk soup with tapioca or rice, gruels, vegetable, corn, potato.

Meats.—Chicken, ham, game, bacon, steak, chops, or roast beef (sparingly once daily).

Fish.—Fresh fish, boiled, broiled, clams (raw), oysters (raw).

Eggs.—Sparingly.

Vegetables.—Cabbage, spinach, boiled onions, cauliflower, young peas, string beans, lettuce.

Farinaceous Foods.—Rice, grits, hominy, oatmeal, cream of wheat, sago, tapioca, potatoes, wheat bread, toast, stale bread (wheat), milk-toast.

Desserts.—Tapioca pudding, rice pudding, milk pudding, bread pudding, custard.

Fruits.—Lemons, oranges, raw, baked, or stewed apples, grapes, stewed pears, stewed prunes.

Fatty Foods.—Butter.

Drinks.—Milk, buttermilk, malted milk, peptonized milk, milk with Vichy, kefir, kumiss, junket, whey, water (not with meals), hot water, grape juice. *Mineral Waters.*—Vichy, Apollinaris, Poland, Lithia, White Rock.

TUBERCULOSIS

General Directions.—It is important to take meat, milk, and eggs in as large quantities as can be digested. Milk, or milk and egg should be taken between meals. Raw meat should be taken daily.

May take:

Soups.—Bouillon, soups made with milk, clam or oyster broth, chicken, beef, mutton, rice, tapioca, or vermicelli broth.

Fish.—Fresh fish of all kinds, as mackerel, trout, or perch, oysters.

Meats.—Raw beef, rare beef, steaks, chops, roast beef, roast mutton, lamb chops, chicken, turkey, fresh game, bacon, ham, Mosquera's beef meal, beef-juice.

Eggs.—Raw, poached, boiled, scrambled, or omelet.

Vegetables.—Spinach, cauliflower, asparagus tops, peas, green string beans, lima beans, lettuce, cresses, celery, baked, mashed or creamed potatoes, onions, tomatoes.

Farinaceous Foods.—Bread, Graham bread, toast, milk-toast, zwieback, pulled bread, oatmeal, rice, grits, hominy, corn meal mush, barley gruel. Farinaceous foods should not be taken in too large quantities.

Fatty Foods.—Cream, butter, olive oil, cod liver oil, extract of red bone-marrow.

Fruits.—Oranges, lemons, raw, baked, or stewed apples, grapes, stewed apricots, pears or prunes, raw or stewed peaches.

Desserts.—Blanc-mange, custards, tapioca, sago, bread or rice pudding, farina, wine jelly, junket, cheese.

Drinks.—Water, carbonated water, milk, buttermilk, peptonized milk, kumiss, kefir, whey, cocoa, chocolate (Vigor), albumin-water, grape-juice, Vichy.

Must not take:

Excesses of starches and sugars, pork, veal, hashes, twice-cooked meats, potted meats, liver, kidney, salt fish, smoked fish, lobster, hot bread and cakes, fried foods, pies, pastry.

EPILEPSY

Breakfast.—Any sort of ripe fresh fruit. Any cereal, as oatmeal, cracked wheat, rice, grits, etc. Soft-boiled, poached, or scrambled eggs, or an omelet. Bread and butter. Any sort of plain crackers if desired. Milk, buttermilk, kumiss, milk and Vichy or eggshake. Phillip's digestible cocoa.

Dinner.—**Soups.**—Any clear soup, consommé or bouillon, chicken, mutton, beef or oyster broth, vegetable purees. Avoid rich and highly seasoned soups.

Meat.—Fish or meat, but not both. Any sort of fresh fish, baked, boiled or broiled. Any sort of plain fresh meat, as roast beef, or mutton, chops or steak or fowl.

Vegetables.—Potatoes, parsnips, celery, tomatoes, spinach, peas, string beans, asparagus, salsify, lettuce, squash, macaroni, rice, spaghetti, hominy.

Desserts.—Fresh fruit, plain puddings, or junket, ice-cream or water-ice.

Supper.—Bread and butter, cereals, stewed fruits, liquids, as for breakfast. If working or taking much exercise, eggs or oysters may be allowed, otherwise very plain suppers are to be preferred.

Avoid:

All fried foods, all rich and highly seasoned dishes, pastry, cake, candies, hot breads, all forms of alcohol, coffee and tea, pork. All foods known to disagree with the patient, and all indigestible articles, as pork, lobster, ham, and the like.

DIET AFTER NORMAL CONFINEMENT

Allowable for First Two Days.

Liquids.—Water as desired. Milk, beef, or chicken broth, with or without well-cooked barley or rice, albumin-water, cocoa, weak tea or coffee. Tea is to be preferred to coffee, as the latter is more liable to cause insomnia.

Solids.—Bread and butter, toast, crackers, milk-toast, poached or soft-boiled egg, well-cooked cereals, wine jelly, custards, and junket.

From First Two Days Until the End of the First Week.

Liquids.—As above.

Solids.—In addition to above, baked or mashed potato, fruits, green vegetables, as peas, string beans, spinach, etc., in moderation. Rice, tapioca, and sago puddings. White meat of fish, either broiled or boiled. Fresh meat, steaks, chops, roast beef or mutton, squab.

Avoid:

Any food which previously disagreed with the patient, and, as a general rule, pork, veal, meat stews, and twice-cooked meats, cabbage, cucumbers, turnips, dried beans, corn, strawberries, unripe or stale fruit and vegetables, and all highly seasoned and complicated dishes.

Sample Diets:

Breakfast.—A sliced orange, well-cooked breakfast cereal, a soft-boiled egg and toast. Cocoa, tea, or coffee.

Dinner.—A cup of meat broth, lamb chops, baked potato, well-cooked spinach, a cup of junket. Bread and butter. Milk to drink.

Supper.—Minced chicken on toast, baked apple and cream, milk to drink; tea if desired.

SAMPLE PAMPHLET OF INFORMATION FOR DISTRIBUTION AMONG THE POOR IN SUMMER

NURSE the baby; mother's milk is the best of all foods.

Do not wean the baby in hot weather.

Remember that ten bottle babies die to one that is breast fed.

One-third of the deaths of infants and young children occur during the hot summer months.

Heat kills the baby chiefly by spoiling the milk given it.

Nurse the baby regularly, not oftener than two hours during the day and four hours at night.

Do not nurse the baby every time it cries.

If you cannot nurse your baby, consult your doctor before giving it the bottle.

Fresh Air.—Give the baby fresh air day and night.

Keep the windows open all day and all night.

Keep the baby out of doors as much as you can.

The out-door air is better for the baby than that of the house.

The air in the squares and parks is better than that of the streets.

Keep the rooms clean.

Do not let garbage, slop, or dirty clothes stand about the room.

Sleep.—Do not let the baby sleep in the same bed with any other person.

Keep the baby quiet and let it sleep as much as it will.

Do not handle the baby too much, let it alone.

Bathing.—Bathe the baby every day.

In very hot weather sponge the baby several times a day to keep it clean and cool.

Wash the baby whenever the diapers are changed.

Clothing.—The baby feels the heat as much or more than you.

In hot weather take off most of the baby's clothing.

If it becomes cold, the clothing can easily be put back.

If the baby has fever, take some of the clothing off, but do not put more on. A baby with fever will not catch cold.

Diapers.—Wash the diaper as soon as it is soiled and dry in the open air.

Do not use a diaper a second time before washing it.

Water.—In hot weather the baby needs a little more water and not so much food.

Give a few teaspoonfuls of pure boiled water several times a day.

Summer diarrhea is caused by spoiled milk or other food, bad air,

dirt, and too much clothing, too much handling, too little sleep, too little water.

If the baby vomits or has loose bowels, stop all food and give plain boiled water until you have seen your doctor.

Do not drug the baby. If your baby is sick send for a doctor or take it to a hospital or dispensary.

Do not ask your neighbors' advice about your baby, ask your doctor.

THE BOTTLE-FED BABY

The Bottles.—Use a common round-bottomed bottle; boil or scald it each time before putting the baby's milk in it.

The Nipples.—Use plain black rubber nipples. Boil them once a day. Wash the nipples before and after each feeding. When not in use keep the nipples in a covered glass filled with water in which you have put a pinch of baking soda or borax.

Never use a nipple with a tube to it.

The Milk.—Get only the best milk for the baby. Better pay more for milk and save doctor bills, and possibly funeral expenses. It costs less to buy a baby good milk for a year than to bury it.

The best milk is bottled at the dairy and delivered in bottles. Milk sold from the can is apt to be dirty and unfit for use. Milk in summer from an open can in a shop is never fit to give a baby.

Milk from a herd is better than milk from one cow.

To Keep Milk.—Take it in as soon as delivered. As soon as possible mix the baby's milk. Place this in clean bottles and stopper with raw cotton.

Keep the milk cold—on ice if possible. If you have no ice, wrap a cloth wrung out in cold water about the bottles.

If you have difficulty in keeping milk, bring it to a boil as soon as it is delivered to you.

Keep the things for the baby's milk separate.

Keep the things clean.

Scald them with boiling water before using.

Milk will spoil
- if it is not kept cold.
- if it is not kept covered.
- if it is dirty.
- if it has been put in dirty bottles or cans.
- if it is measured in dirty cans.
- if it gets dust in it.

WEIGHTS AND MEASURES

Relative Value of Apothecaries' and Metric Measure.

Minims.	Cubic centimeters.	Minims.	Cubic centimeters.	Fluidounces.	Cubic centimeters.	Fluidounces.	Cubic centimeters.
1 =	0.06	30 =	1.90	1 =	30.00	21 =	621.00
2 =	0.12	35 =	2.16	2 =	59.20	22 =	650.00
3 =	0.18	40 =	2.50	3 =	89.00	24 =	710.00
4 =	0.24	45 =	2.80	4 =	118.40	25 =	740.00
5 =	0.30	50 =	3.08	5 =	148.00	26 =	769.00
6 =	0.36	55 =	3.40	6 =	178.00	27 =	798.07
7 =	0.42			7 =	207.00	28 =	828.80
8 =	0.50	Fluid-drams.		8 =	236.00	30 =	887.25
9 =	0.55			9 =	266.00	31 =	917.00
10 =	0.60	1 =	3.75	10 =	295.70	32 =	946.00
11 =	0.68	$1\frac{1}{4}$ =	4.65	12 =	355.00	48 =	1419.00
12 =	0.74	$1\frac{1}{2}$ =	5.60	13 =	385.00	56 =	1655.00
13 =	0.80	$1\frac{3}{4}$ =	6.51	14 =	414.00	64 =	1892.00
14 =	0.85	2 =	7.50	15 =	444.00	72 =	2128.00
15 =	0.92	3 =	11.25	16 =	473.11	80 =	2365.00
16 =	1.00	4 =	15.00	17 =	503.00	96 =	2839.00
17 =	1.05	5 =	18.50	18 =	532.00	112 =	3312.00
18 =	1.12	6 =	22.50	19 =	591.50	128 =	3785.00
19 =	1.17	7 =	26.00				
20 =	1.25						
25 =	1.54						

Relative Value of Metric and Apothecaries' Measure.

Cubic centimeters.	Fluidounces.	Cubic centimeters.	Fluidounces.	Cubic centimeters.	Fluidrams.	Cubic centimeters.	Minims.
1000 =	33.81	400 =	13.53	25 =	6.76	4 =	64.80
900 =	30.43	300 =	10.14	10 =	2.71	3 =	48.60
800 =	27.05	200 =	6.76	9 =	2.43	2 =	32.40
700 =	23.67	100 =	3.38	8 =	2.16	1 =	16.23
600 =	20.29	75 =	2.53	7 =	1.89	0.50 =	8.11
500 =	16.90	50 =	1.69	6 =	1.62	0.25 =	4.06
473 =	16.00	30 =	1.01	5 =	1.35	0.06 =	1.00

Relative Value of Avoirdupois and Metric Weight.

Avoir. ounces.		Grams.	Avoir. ounces.		Grams.	Avoir. ounces.		Grams.	Avoir. pounds.		Grams.
$\frac{1}{16}$	=	1.772	5	=	141.75	13	=	368.54	3	=	1360.78
$\frac{1}{8}$	=	3.544	6	=	170.10	14	=	396.90	4	=	1814.37
$\frac{1}{4}$	=	7.088	7	=	198.45	15	=	425.25	5	=	2267.55
$\frac{1}{2}$	=	14.175	8	=	226.80	Avoir. pounds.			6	=	2721.55
1	=	28.350	9	=	255.15				7	=	3175.14
2	=	56.700	10	=	283.50	1.0	=	453.60	8	=	3628.74
3	=	85.050	11	=	311.84	2.0	=	907.18	9	=	4082.33
4	=	113.400	12	=	340.20	2.2	=	1000.00	10	=	4535.92

Relative Value of Metric and Avoirdupois Weight.

Gm.	Ounces.	Grains.	Gm.	Ounces.	Gr.	Gm.	Ounces.	Gr.	Gm.	Ounces.	Gr.
28.35	= 1		38	= 1	+ 149	125	= 4	+ 179	600	= 21	+ 72
29.00	= 1	+ 10	39	= 1	+ 164	150	= 5	+ 127	650	= 22	+ 405
30.00	= 1	+ 25	40	= 1	+ 180	200	= 7	+ 24	700	= 24	+ 303
32.00	= 1	+ 56	50	= 1	+ 334	250	= 8	+ 358	750	= 26	+ 198
33.00	= 1	+ 72	60	= 2	+ 50	300	= 10	+ 255	800	= 28	+ 96
34.00	= 1	+ 87	70	= 2	+ 205	350	= 12	+ 152	850	= 29	+ 429
35.00	= 1	+ 103	80	= 2	+ 300	400	= 14	+ 48	900	= 31	+ 326
36.00	= 1	+ 118	85	= 3		500	= 17	+ 279	950	= 33	+ 222
37.00	= 1	+ 133	100	= 3	+ 230	550	= 19	+ 175	1000	= 35	+ 120

Relative Value of Apothecaries' and Metric Weight.

Grains.		Grams.	Grains.		Grams.	Drams.		Grams.
1	=	0.0625	24	=	1.55	1	=	3.90
2	=	0.1300	25	=	1.62	2	=	7.80
3	=	0.1950	26	=	1.70	3	=	11.65
4	=	0.2600	27	=	1.75	4	=	15.50
5	=	0.3240	28	=	1.82	5	=	19.40
6	=	0.4000	30	=	1.95	6	=	23.30
7	=	0.4600	32	=	2.10	7	=	27.20
8	=	0.5200	33	=	2.16	Ounces.		
9	=	0.6000	34	=	2.20	1	=	31.10
10	=	0.6500	35	=	2.25	2	=	62.20
11	=	0.7150	36	=	2.30	3	=	93.30
12	=	0.7800	38	=	2.47	4	=	124.40
14	=	0.9070	39	=	2.55	5	=	155.50
15	=	0.9720	40	=	2.73	6	=	186.60
15.5	=	1.0000	44	=	2.86	7	=	217.70
16	=	1.0400	48	=	3.00	8	=	248.80
18	=	1.1600	50	=	3.25	9	=	280.00
20	=	1.3000	52	=	3.40	10	=	311.00
21	=	1.3600	56	=	3.65	48	=	1492.80
22	=	1.4250	58	=	3.75	100	=	3110.40

Relative Value of Metric and Avoirdupois Weight.

1	=	15.43	6	=	92.60	100	=	1543.23
2	=	30.86	7	=	98.02	125	=	1929.04
3	=	46.30	8	=	123.46	150	=	2374.85
4	=	61.73	9	=	138.90	175	=	2700.65
5	=	77.16	10	=	154.32	1000	=	15432.35

LOCKE'S TABLES OF FOOD VALUES

Through the courtesy of Dr. Edwin A. Locke of Boston, and of D. Appleton and Company of New York, we are permitted to reproduce some of the practical tables for use in private practice and public institutions as arranged by Dr. Locke. These tables will be found of great value, inasmuch as they deal with the composition of foods as they are actually eaten.

TABLE EQUIVALENTS (APPROXIMATE)

1 teaspoon .... fluid	= 5	c.c. or	⅙	fluid ounce
1 dessertspoon .... fluid	= 10	c.c. or	⅓	fluid ounce
1 tablespoon .... fluid	= 15	c.c. or	½	fluid ounce
1 ordinary cup .... fluid	= 250	c.c. or	8	fluid ounces
1 tumbler or glass .... fluid	= 250	c.c. or	8	fluid ounces
1 cordial glass .... fluid	= 20	c.c. or	⅔	fluid ounce
1 sherry glass .... fluid	= 30	c.c. or	1	fluid ounce
1 cocktail glass .... fluid	= 75	c.c. or	2½	fluid ounces
1 claret glass .... fluid	= 120	c.c. or	4	fluid ounces
1 champagne glass .... fluid	= 135	c.c. or	4½	fluid ounces

ABBREVIATIONS

a.	= average
a. h.	= average helping
c.	= cup
d.	= diameter
dsp.	= dessertspoon
h.	= heaping
m.	= medium
sq.	= square
tbsp.	= tablespoon
tsp.	= teaspoon

PREPARED FOODS—EDIBLE PORTION.*

FOOD STUFFS.	Portion.	Quantity.	Water.	Weight.	Protein.		Fats.		Carbo-hydrates.		Total Calories.	Calories per 100 Grams.
			Grams.	Grams.	Grams.	Calories.	Grams.	Calories.	Grams.	Calories.		
1. MEATS.												
Beef:												
Beef juice	a. h.	4 oz.	120	111.60	5.88	24.1	0.72	6.7	......	.....	31	25
Corned beef, canned	a. h.	1 slice.	50	25.90	13.15	53.9	9.35	87.0	......	.....	141	282
Corned beef hash	a. h.	2 h. tbsp.	100	80.30	6.00	24.6	1.90	17.7	9.40	38.5	81	81
Roast	a. h.	1 slice.	100	48.20	22.30	91.4	28.60	266.0	......	.....	357	357
Roast, very lean	a. h.	1 "	100	73.71	23.33	95.7	1.66	15.4	......	.....	111	111
Scraped (round), approximate	a. h.	4-in. pat.	100	67.80	20.90	85.7	10.60	98.6	......	.....	184	184

* In this table the figures given are for the edible portion in every case unless otherwise specified.

So far as possible the values of the various prepared dishes have been computed from Atwater's chemical analyses in order that the table may be as uniform as possible. When the authority is not indicated, therefore, it is understood that the figures were taken from this source. The recipes in the case of made dishes, like puddings, sauces, etc., have been taken from many sources, but chiefly from Sachse: "How to Cook for the Sick and Convalescent."

In a given group of foods as roast meats and soups, the quantity served has been somewhat arbitrarily made the same, as in this way the relative values are best indicated. The fractions in the weights of the average serving have uniformly been disregarded, as also in the case of the total calories. When the ingredients are stated, as in the case of puddings and sauces, only the

MEATS

Food Stuffs.	Portion.	Quantity.	Weight.	Water.	Protein.		Fats.		Carbohydrates.		Total Calories.	Calories per 100 Grams.
			Grams.	Grams.	Grams.	Calories.	Grams.	Calories.	Grams.	Calories.		
Beef—Continued												
Steak, round, fat, removed	a. h.	1 slice.	100	63.00	27.60	113.2	7.70	71.6	......	.....	185	185
Steak, tenderloin	a. h.	1 "	100	54.80	23.50	96.4	20.40	189.7	......	.....	286	286
Sweetbread	a. h.	1 "	80	45.95	32.00	131.2	0.45	4.2	......	.....	135	169
Tongue, canned	a. h.	1 "	25	12.83	4.88	20.0	5.80	53.9	......	.....	74	295
Chicken:												
Capon	a. h.	1 slice.	100	59.90	27.00	110.7	11.50	107.0	......	.....	218	218
Creamed on toast	a. h.	2 h. tbsp	125	72.81	16.26	66.7	12.62	117.4	21.76	89.2	273	219
Fricasseed	a. h.	1 slice.	100	67.50	17.60	72.2	11.50	107.0	2.40	9.8	189	189
Roast [2]	a. h.	1 "	100	60.30	32.10	131.6	4.40	40.9	2.10	8.6	181	181
Lamb:												
Chop with bone	a. h.	1 chop.	100	47.60	21.70	89.0	29.90	278.1	......	.....	367	367
Roast	a. h.	1 slice.	75	50.33	14.78	60.6	9.53	88.6	......	.....	150	200

total weights and values are given, but these can be readily calculated separately if desired by reference to these ingredients in other parts of the table or in Table IV.

The proportion of water in a considerable number of cases is only approximate, being reckoned as the difference between the total weight and the total of the protein, carbohydrates, fats and ash.

MEATS.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Mutton:												
Boiled, lean	a. h.	1 slice.	75	47.61	23.18	95.0	3.38	31.4	......	.....	126	168
Chop	a. h.	1 chop.	100	71.80	22.60	92.7	4.50	41.9	......	.....	135	135
Roast leg	a. h.	1 slice.	75	38.18	18.75	76.9	16.95	157.8	......	.....	234	313
Pork:												
Bacon, smoked, uncooked	a. h.	1 slice.	30	6.06	3.15	12.9	19.44	180.8	......	.....	194	646
Chop	a. h.	1 chop.	70	47.18	17.92	73.5	4.20	39.1	......	.....	113	161
Ham, smoked, boiled, as purchased	a. h.	1 slice.	33	0.69	7.29	29.9	6.80	63.2	......	.....	93	291
Ham, smoked, fried	a. h.	1 "	35	12.81	7.77	31.9	11.62	108.1	......	.....	140	400
Roast	a. h.	1 "	100	60.68	28.42	116.5	10.00	93.0	......	.....	210	210
Sausage, uncooked	a. h.	1 sausage.	35	13.93	4.55	18.7	15.47	143.9	0.39	1.6	164	468
Turkey:												
Roast	a. h.	1 slice.	100	52.00	27.80	114.0	18.40	171.1	......	.....	285	285
Veal:												
Calf's-foot jelly	a. h.	1 h. tbsp.	50	38.80	2.15	8.8	......	.....	8.70	35.7	45	89
Cutlet	a. h.	1 cutlet.	80	55.16	22.82	93.6	1.14	10.6	......	.....	104	133
Roast	a. h.	1 slice.	75	51.77	21.33	87.5	1.00	9.3	......	.....	97	132

FISH.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
2. Fish.												
Bluefish *	a. h.	....	100	68.20	25.90	106.2	4.50	41.9	......	.....	148	148
Cod	a. h.	....	100	76.32	21.68	88.9	.27	2.5	1.58	6.5	98	98
Haddock	a. h.	....	100	72.37	21.98	90.1	.36	3.3	3.63	14.9	108	108
Halibut	a. h.	....	100	74.46	20.35	83.4	4.04	37.6	......	.....	121	121
Mackerel	a. h.	....	70	51.19	11.73	48.1	4.84	45.0	2.62	10.7	104	148
Salmon	a. h.	....	100	65.32	19.65	80.6	10.21	95.0	5.36	22.0	198	198
Sardines, canned	....	1 fish.	10	5.23	2.30	9.4	1.97	18.3	......	.....	28	278
Smelts	....	1 "	14	11.30	2.23	9.1	.26	2.4	.06	.2	12	85
Spanish mackerel, broiled	a. h.	....	100	63.50	21.80	89.4	5.90	54.9	......	.....	144	144
Sturgeon, Russian caviare.	a. h.	1 h. tsp.	10	3.81	3.00	12.3	1.97	18.3	.76	3.1	34	337
Trout, brook	a. h.	....	50	36.79	10.57	43.3	1.17	10.9	.62	2.5	57	114
Shellfish												
Clams, long	a. h.	6 clams.	150	128.70	12.90	52.9	1.5	14.0	3.00	12.3	79	53
Clams, round	a. h.	6 "	100	86.20	6.50	26.7	.4	3.7	4.20	17.2	47	47

* When not otherwise indicated, the method of cooking is by boiling. Many of the cooked fishes are usually served with a sauce of some kind, but in no instance is the food value of the sauce included unless so specified. This can be easily computed by reference to the section on condiments and sauces given later in the table, and added if desired.

SHELLFISH AND SOUPS.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Shellfish—Continued.												
Crabs, hard shelled, as purchased	a. h.	1 crab.	245	89.92	19.36	79.4	2.21	20.6	1.47	6.0	106	
Lobster	a. h.	....	105	83.16	17.22	70.6	1.89	17.6	.42	1.7	90	91
Oysters	a. h.	6 oysters.	85	73.86	5.27	21.6	1.02	9.5	3.15	12.9	44	86
Oysters, creamed, on	a. h.	6 oysters on 1										52
toast		slice toast.	205	148.12	12.57	51.5	16.13	150.0	25.62	105.0	307	150
Oyster stew	a. h.	4 oz.	124	95.00	6.07	24.9	11.06	102.9	10.53	43.2	171	138
Scalloped oysters	a. h.	6 large oysters.	138	97.40	8.06	33.0	18.58	172.8	11.98	49.1	255	185
Scallops, fried	a. h.	3 h. tbsp.	110	154.38	28.20	115.6	1.75	17.3	6.02	24.7	158	144
3. Soups.												
Bean, home made	a. h.	4 oz.	120	101.16	3.84	15.7	1.68	15.6	11.28	46.2	78	65
Beef, home made	a. h.	4 "	120	111.48	5.28	21.6	.48	4.5	1.32	5.4	32	26
Bouillon, canned	a. h.	4 "	120	115.92	2.64	10.8	.12	1.1	.24	1.0	13	11
Chicken, home made	a. h.	4 "	120	101.16	12.60	51.7	.96	8.9	2.88	11.8	72	61
Chicken gumbo, canned	a. h.	4 "	120	107.04	4.56	18.7	1.08	10.0	5.64	23.1	52	43
Clam chowder, home made	a. h.	4 "	120	106.44	2.16	8.8	.96	8.9	8.04	33.0	51	43
Consommé, canned	a. h.	4 "	120	115.20	3.00	12.3	......	....	.48	2.0	14	12

SOUPS AND DAIRY PRODUCTS.

Food Stuffs.	Portion.	Quantity.	Weight.	Water.	Protein.		Fats.		Carbohydrates.		Total Calories.	Calories per 100 Grams.
			Grams.	Grams.	Grams.	Calories.	Grams.	Calories.	Grams.	Calories.		
Cream soups, home made:												
Asparagus	a. h.	4 oz.	125	104.50	3.44	14.1	8.62	80.2	4.87	20.0	114	92
Celery	a. h.	4 "	125	104.25	3.00	12.3	8.94	83.1	5.01	20.5	116	93
Corn	a. h.	4 "	125	99.34	3.75	15.4	8.70	80.9	10.66	43.7	140	112
Pea	a. h.	4 "	125	92.92	6.29	25.8	8.46	78.7	14.07	57.7	162	130
Potato	a. h.	4 "	125	102.25	2.87	11.8	9.03	84.0	9.60	39.4	135	108
Tomato	a. h.	4 "	125	102.44	2.99	12.3	9.40	87.4	6.36	26.1	126	101
Green turtle, canned	a. h.	4 "	120	103.92	7.32	30.0	2.28	21.2	4.68	19.2	70	58
Julienne, canned	a. h.	4 "	120	115.08	3.24	13.3	......	.....	.6	2.5	16	13
Meat stew, home made	a. h.	....	180	152.10	8.28	33.9	7.74	72.0	9.90	40.6	147	81
Mock turtle, canned	a. h.	4 oz.	120	107.76	6.24	25.6	1.08	10.1	3.36	13.8	50	41
Mulligatawny, canned	a. h.	4 "	120	107.16	4.44	18.2	.12	1.1	6.84	28.0	47	40
Oxtail, canned	a. h.	4 "	120	106.56	4.80	19.7	1.56	14.5	5.16	21.2	55	46
Pea, canned	a. h.	4 "	120	104.28	4.32	17.7	.84	7.8	9.12	37.4	63	52
Tomato, canned	a. h.	4 "	120	108.00	2.16	8.9	1.32	12.3	6.72	27.6	49	41
Vegetable, canned	a. h.	4 "	120	114.84	3.48	14.3	......	.....	.6	2.5	17	14
4. Dairy Products and Eggs.												
Butter	a. h.	1 ball.	15	1.65	0.15	0.6	12.75	118.6	......	.....	119	795

DAIRY PRODUCTS.

Food Stuffs.	Portion.	Quantity.	Weight.	Water.	Protein.		Fats.		Carbo-hydrates.		Total Calories.	Calories per 100 Grams.
			Grams.	Grams.	Grams.	Calor-ies.	Grams.	Calor-ies.	Grams.	Calor-ies.		
Cream:												
"Average"	a. h.	1 tbsp.	20	13.28	.74	3.0	5.14	47.8	0.71	2.9	54	269
"Heavy"	a. h.	1 "	20	11.66	.43	1.8	7.24	67.4	.58	2.4	72	358
"Thick"	a. h.	1 "	20	7.87	.31	1.3	11.22	104.3	.46	1.9	108	540
Whipped	a. h.	1 h. tbsp.	30	17.9	1.11	4.6	7.72	71.8	1.06	4.3	81	269
Cheese:												
American, pale	a. h.	1 cu. in.	20	6.32	5.70	23.6	7.18	66.7	.06	.2	91	453
Camembert	a. h.	1 h. tsp.	20	9.72	4.20	17.2	4.34	40.4	......	.....	58	290
Cheddar	a. h.	1 " "	20	5.48	5.54	23.7	7.36	67.5	.82	3.4	95	473
Cheshire	a. h.	1 " "	20	7.42	5.38	22.1	6.14	57.1	.18	.7	80	399
Dutch	a. h.	2 scoops.	20	7.04	7.42	30.4	3.54	32.9	......	.....	63	316
Fromage de Brie	a. h.	1 cu. in.	20	12.04	3.18	13.0	4.20	39.1	.28	1.2	53	267
Full cream	a. h.	1 " "	20	6.84	5.18	21.2	6.74	62.7	.48	2.0	86	430
Limburger	a. h.	1 " "	20	8.42	4.60	18.9	5.88	54.7	.08	.3	74	369
Neufchatel	a. h.	1 " "	20	10.00	3.74	15.3	5.48	51.0	.30	1.2	68	337
Pineapple	a. h.	2 scoops.	20	4.60	5.98	24.5	7.78	72.4	.52	2.1	99	495
Roquefort	a. h.	1 cu. in.	20	7.86	4.52	18.5	5.90	54.9	.36	1.5	75	375
Stilton	a. h.	2 scoops.	20	5.52	4.78	19.6	7.78	72.4	......	.....	92	460
Swiss	a. h.	1 slice.	20	6.28	5.52	22.6	6.98	64.9	.26	1.1	89	443
Koumiss	a. h.	wineglass.	130	116.09	3.64	14.9	2.73	25.4	7.02	28.7	69	53

MILK AND EGGS.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Milk:												
Buttermilk	a. h.	1 glass.	218	198.38	6.54	26.8	1.09	10.1	10.46	42.9	80	36
Condensed milk, sweetened	a. h.	1 tbsp.	26	6.99	2.28	9.4	2.16	20.0	14.07	57.7	87	335
Condensed milk, unsweetened (evaporated cream)	a. h.	1 tbsp.	20	13.64	1.92	7.9	1.86	17.3	2.24	9.2	34	172
Skimmed milk	a. h.	1 glass.	222	200.91	7.55	31.0	.67	6.2	11.32	46.4	84	37
Whole milk	a. h.	1 "	220	191.40	7.26	29.8	8.80	81.8	11.00	45.1	157	72
Whey	a. h.	1 "	203	188.79	2.03	8.3	.61	5.7	10.15	41.6	56	28
Eggs:												
Hens', boiled	a. h.	1 egg.	50	36.60	6.60	27.1	6.00	55.8	......	.....	83	169
Hens', uncooked	a. h.	1 "	50	36.85	6.70	27.5	5.25	48.8	......	.....	76	159
Hens', whites, boiled	....	1 "	32	27.58	4.16	17.1	.06	.6	......	.....	18	55
Hens', yolks, boiled	....	1 "	18	8.91	2.89	11.8	5.99	55.7	......	.....	68	376
Omelette	a. h.	½ omelette.	75	48.57	9.80	40.2	14.01	130.3	1.55	6.4	177	236
Ingredients: 3 tbsp. milk. 3 eggs. 1 h. tsp. butter.												

VEGETABLES.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
5. Vegetables.												
Artichokes, French......	a. h.	1 artichoke.	360	329.80	6.48	26.6	.29	2.7	16.56	67.9	97	27
Asparagus, canned	a. h.	....	125	118.00	1.88	7.7	.13	1.2	3.50	14.4	23	19
Beans:												
Baked, home made	a. h.	3 h. tbsp.	150	91.17	10.83	44.4	12.76	118.7	32.84	134.6	298	199
Baked, canned	a. h.	3 " "	115	79.24	7.94	32.6	2.88	26.8	22.54	92.4	152	132
Butter	a. h.	4 " "	80	62.78	3.78	15.5	.24	2.2	11.60	47.6	65	81
Lima	a. h.	2 " "	80	48.10	6.40	26.2	.54	5.0	23.60	96.8	128	160
Red kidney, canned	a. h.	2 " "	70	50.89	4.90	20.1	.14	1.3	12.95	53 1	75	106
String	a. h.	2 " "	60	57.18	.48	2.0	.66	6.1	1.14	4.7	13	21
Beets	a. h.	2 " "	70	62.02	1.61	6.6	.07	.7	5.18	21.2	29	41
Beet greens	a. h.	2 " "	100	89.50	2.20	9.0	3.40	31.6	3.20	13.1	54	54
Cabbage	a. h.	3 " "	100	97.40	.60	2.5	.10	.9	.40	1.6	5	5
Carrots	a. h.	3 " "	100	93.40	.53	2.2	.17	1.6	3.39	13.9	18	18
Cauliflower	a. h.	2 " "	120	117.48	1.08	4.4	.12	1.1	.48	2.0	8	7
Celery, creamed..........	a. h.	3 " "	90	78.90	1.42	5.8	4.98	46.3	3.46	14.2	66	73
Celery, uncooked	a. h.	3 small stalks.	55	41.60	.50	2.1	.05	.5	1.43	5.9	8	19
Corn, canned	a. h.	2 h. tbsp.	100	76.10	2.80	11.5	1.20	11.2	19.00	77.9	101	101
Corn, green	a. h.	1 ear.	100	76.25	3.07	12.6	1.10	10.2	18.78	77.0	100	100
Cucumber, uncooked	a. h.	8 thin slices.	50	47.70	.40	1.6	.10	.9	1.55	6.4	9	18
Dandelion greens	a. h.	2 h. tbsp.	100	81.40	2.39	9.8	1.01	9.4	10.67	43.8	63	63

VEGETABLES.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Mushrooms, broiled	a. h.	2 large on toast.	57	30.58	3.52	14.4	8.94	83.1	12.85	52.7	150	263
Mushrooms, uncooked	....	2 large.	45	39.65	1.58	6.5	.18	1.7	3.06	12.5	21	46
Onions	a. h.	1 onion.	100	91.20	1.20	4.9	1.80	16.7	4.90	20.1	42	42
Parsnips	a. h.	4 slices.	100	97.28	.22	.9	.29	2.7	1.46	6.0	10	10
Peas, green	a. h.	3 h. tbsp.	92	67.90	6.16	25.3	3.13	29.1	13.43	55.1	110	119
Potatoes, sweet, boiled	a. h.	a. size.	100	51.90	3.00	12.3	2.10	19.5	42.1	172.6	204	204
Potatoes, white:												
Baked	a. h.	m. size.	130	90.87	3.77	15.5	.20	1.9	32.07	131.5	149	114
Boiled	a. h.	" "	150	113.25	3.75	15.4	.15	1.4	31.35	128.5	145	97
Chips	a. h.	3 h. tbsp.	50	1.10	3.40	13.9	19.90	185.1	23.35	95.7	295	589
Creamed	a. h.	4 " "	115	85.79	3.61	14.8	5.17	48.1	19.07	78.2	141	123
Mashed and creamed	a. h.	2 " "	100	75.10	2.60	10.7	3.00	27.9	17.80	73.0	112	112
Squash	a. h.	2 " "	100	83.62	1.36	5.6	.82	7.6	13.60	55.8	69	69
Spinach	a. h.	2 " "	100	89.80	2.10	8.6	4.10	38.1	2.60	10.7	57	57
Tomatoes, canned	a. h.	2 " "	70	65.80	.84	3.4	.14	1.3	2.80	1.4	16	23
Tomatoes, uncooked	a. h.	m. size.	200	188.00	2.40	9.8	.40	3.7	8.00	32.8	46	23
Turnips	a. h.	2 h.tbsp.	140	136.15	.45	1.8	.08	.7	.91	3.7	6	4

FRUITS.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbo-hydrates. Grams.	Carbo-hydrates. Calories.	Total Calories.	Calories per 100 Grams.
6. Fruits.												
A. *Fresh*, as purchased:												
Apple	a. h.	a. size.	150	94.95	.45	1.8	.45	4.2	16.20	66.4	72	49
Banana	a. h.	a. "	194	94.86	1.55	6.4	.78	7.3	27.74	113.7	127	66
Blackberries	a. h.	3 h. tbsp.	100	86.30	1.30	5.3	1.00	9.3	10.90	44.7	59	59
Cantaloupe	a. h.	½ melon.	465	232.50	1.40	5.7	......	.....	21.39	87.7	93	20
Cherries	a. h.	About ¼ lb.	100	76.80	.90	3.7	.80	7.4	15.90	65.2	76	76
Currants	a. h.	4 h. tbsp.	100	85.00	1.50	6.2	......	.....	12.80	52.5	59	59
Grapefruit	a. h.	½ large.	300	......	2.37	9.7	.60	5.6	30.27	124.1	139	46
Grapes	a. h.	1 bunch.	150	87.00	1.50	6.2	1.80	16.7	21.60	88.6	112	74
Gooseberries	a. h.	4 h. tbsp.	90	77.04	.90	3.7	......	.....	11.79	48.3	52	56
Huckleberries	a. h.	4 " "	100	81.90	.60	2.5	.60	5.6	16.60	68.1	76	76
Lemon	....	a. size.	130	81.25	.91	3.7	.65	6.0	7.67	31.4	41	32
Orange	a. h.	a. "	250	158.50	1.50	6.2	.25	2.3	21.25	87.1	96	37
Peach	a. h.	a. "	128	93.82	.64	2.6	.13	1.2	9.86	40.4	44	34
Pear	a. h.	a. "	156	118.56	.78	3.2	.62	5.8	19.81	81.2	90	57
Pineapple, edible portion	a. h.	2 slices.	100	89.30	.40	1.6	.30	2.8	9.70	39.8	44	44
Plum	a. h.	a. size.	35	26.07	.32	1.3	......	.....	6.69	27.4	29	81
Raspberries	a. h.	3 h. tbsp.	82	70.36	.82	3.4	......	.....	10.33	42.3	46	56
Strawberries	a. h.	4 " "	100	90.40	1.00	4.1	.60	5.6	7.40	30.3	40	40
Watermelon	a. h.	Large slice	300	112.50	.60	2.5	.30	2.8	8.10	33.2	39	13

FRUITS.

Food Stuffs	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
B. *Dried*, as purchased:												
Apricots	....	10 large.	80	23.52	3.76	15.4	.80	7.4	50.00	205.0	228	284
Dates	....	10 "	83	11.45	1.58	6.5	2.08	19.3	58.60	240.3	266	320
Figs	....	10 "	195	36.66	8.38	34.4	.58	5.4	144.69	592.8	633	325
Prunes	....	10 very large.	200	38.00	3.60	14.8	......	.....	124.40	510.0	525	262
Raisins	....	10 " "	25	3.28	.57	2.3	.75	7.0	17.13	70.2	80	318
C. *Stewed, Jellies, etc.*:												
Apple, baked	a. h.	1 large.	120	88.67	.61	2.5	.58	5.4	29.30	120.1	128	107
Apple sauce	a. h	3 h. tbsp.	125	76.38	.25	1.0	1.00	9.3	46.50	190.7	201	161
Apricot sauce	a. h.	3 " "	112	50.62	2.13	8.7	1.46	13.6	54.66	224.1	246	220
Cranberries, stewed	a. h.	2 h. tbsp.	100	60.70	0.27	1.1	0.41	3.8	36.00	147.6	153	153
Currant jelly	a. h.	1 " "	35	7.23	.36	1.5	......	.....	27.16	111.4	113	323
Figs, stewed	a. h.	3 figs.	125	70.62	1.50	6.2	.38	3.5	51.13	209.6	219	173
Marmalade, orange	a. h.	1 h. tbsp.	30	4.35	.18	.7	.03	.3	25.35	103.9	105	349
Prune sauce	a. h.	4 very large and juice.	200	153.20	1.00	4.1	.20	1.9	44.60	182.9	189	95
Rhubarb, stewed	a. h.	2 h. tbsp.	90	56.26	.40	1.6	.47	4.4	32.40	132.8	139	154

Sugar used in preparation of the stewed fruits and jellies is included in the calculations.

BREAD STUFFS.

FOOD STUFFS.	Portion.	Quantity.	Weight.	Water.	Protein.		Fats.		Carbo-hydrates.		Total Calories.	Calories per 100 Grams.
			Grams.	Grams.	Grams.	Calories.	Grams.	Calories.	Grams.	Calories.		
7. BREAD, CRACKERS, ETC.												
A. *Bread:*												231
Brown, baker's	1 slice.	4x4x½ in.	80	34.88	4.32	17.7	1.44	13.4	37.68	154.5	186	266
Corn (johnnycake) ..	1 "	3x2x¾ "	39	15.17	3.08	12.6	1.83	17.0	18.06	74.1	104	260
Rye	1 "	3½x3x½ in.	39	13.92	3.51	14.4	.23	2.1	20.74	85.0	102	
Wheat:												
Buns, cinnamon ...	1 bun.	....	45	10.62	4.23	17.3	3.24	30.1	26.59	109.0	156	347
Buns, currant	1 "	....	50	13.75	3.35	13.7	3.80	35.3	28.80	118.1	167	334
Gluten	1 slice.	3½x2¾x½ in.	39	14.90	3.63	14.9	.55	5.1	19.42	79.6	100	256
Graham	1 "	3¾x2¾x½ "	37	13.21	3.29	13.5	.67	6.2	19.28	79.1	99	267
Biscuits, home made	1 biscuit.	....	35	11.52	3.05	12.5	.91	8.5	19.36	79.4	100	287
Biscuits, soda	1 "	....	38	8.70	3.53	14.5	5.21	48.5	19.99	82.0	145	381
Rolls, French	1 roll.	....	39	12.48	3.32	13.6	.98	9.1	21.72	89.1	112	287
Rolls, Vienna	1 "	....	45	14.27	3.83	15.7	.99	9.2	25.43	104.3	129	287
Toasted	½ slice.	4x2x¼ in.	10	2.40	1.15	4.7	.16	1.5	6.12	25.1	31	313
White, baker's	1 "	3½x3x½ in.	30	10.59	2.76	11.3	.39	3.6	15.93	65.3	80	268
White, home made..	1 "	3x4x½ in.	37	12.95	3.37	13.8	.59	5.5	19.72	80.9	100	270
Whole wheat	1 "	3½x3½x½ in.	42	16.13	4.07	16.7	.38	3.5	20.87	85.6	106	251
Zwieback	1 "	3½x2x½ in.	15	.87	1.47	6.0	1.49	13.9	11.03	45.2	65	434

CRACKERS AND SANDWICHES.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
B. *Crackers:*												
Boston (split)	1 cracker.	d. 2 in.	10	.75	1.10	4.5	.85	7.9	7.11	29.2	42	416
Butter	1 "	d. 2 "	4	.29	.38	1.6	.40	3.7	2.86	11.7	17	427
Cream lunch	1 "	d. 3 "	13	.88	1.26	5.2	1.57	14.6	9.06	37.2	57	439
Graham	1 "	3 in. sq.	8	.43	.80	3.3	.75	7.0	5.9	24.2	34	429
Oatmeal	1 "	3 " "	10	.63	1.18	4.8	1.11	10.3	6.90	28.3	43	434
Oyster	10 cr'k'rs.	d. 1 in.	11	.53	1.24	5.1	1.16	10.8	7.76	31.8	48	433
Pilot bread	1 cracker.	d. 5 "	33	2.87	3.66	15.0	1.65	15.4	24.49	100.4	131	397
Pretzels	1 "	....	6	.58	.58	2.4	.23	2.1	4.37	17.9	22	375
Saltines	1 "	2 in sq.	3	.17	.32	1.3	.38	3.5	2.06	8.4	13	492
Soda:												
Educators	1 "	2 " "	3	.08	.97	4.0	......	.....	1.39	5.7	10	333
Uneeda biscuits	1 "	3 " "	6	.35	.59	2.4	.55	5.1	4.38	17.7	25	424
Zephyrs	1 "	3½ in. sq.	10	.59	.98	4.0	.91	8.5	7.31	30.0	43	424
C. *Sandwiches:*												
Chicken	a. h.	1 sandwich.	70	33.95	8.61	35.3	3.78	35.2	22.47	92.1	163	232
Egg	a. h.	1 "	100	41.40	9.60	39.4	12.70	118.1	34.50	141.5	299	299
Ham	a. h.	1 "	70	24.15	7.28	29.8	10.07	93.7	26.65	109.3	233	332

BREAKFAST FOODS.

FOOD STUFFS.	Portion.	Quantity.	Water.	Weight.	Protein.		Fats.		Carbohydrates.		Total Calories.	Calories per 100 Grams.
			Grams.	Grams.	Grams.	Calories.	Grams.	Calories.	Grams.	Calories.		
8. BREAKFAST FOODS, MILK GRUELS, ETC.*												
Cream toast	a. h.	2 slices.	136	71.28	9.03	37.0	14.60	135.8	37.15	152.3	325	238
Ingredients: 2 slices toast. 5 tbsp. cream sauce												
Farina	a. h.	2 h. tbsp	100	86.63	1.65	6.8	.21	2.0	11.45	47.0	56	56
Force	a. h.	5 " "	18	1.67	1.70	7.0	.24	2.2	13.87	56.9	66	367
Grapenuts	a. h.	5 " "	65	4.02	7.78	31.9	.40	3.7	51.51	211.2	247	380
Gruels (milk):												
Arrowroot	a. h.	4 h. tbsp.	200	155.78	8.25	33.8	10.00	93.0	24.20	99.2	226	113
Ingredients: 1 tbsp. arrowroot. 1 c. milk.												
	a. h.	4 " "										
Ingredients: 1 tbsp. barley flour. 1¼ c. milk.			120	93.12	5.94	24.4	6.41	59.6	13.25	54.3	138	115

* The sugar, milk or cream, with which any of this group may be served, is not considered and their caloric value must therefore be added when used.

BREAKFAST FOODS.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Grams. Water.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Gruels (milk)—Continued												
Cornmeal	a. h.	4 h. tbsp.	115	96.76	3.85	15.8	4.11	38.2	9.52	39.0	93	81
Ingredients:												
2 tbsp. white corn meal.												
2 c. milk.												
Oatmeal	a. h.	2 " "	100	59.81	8.72	35.8	8.10	75.3	21.83	89.5	201	201
Ingredients:												
3 tbsp. oatmeal.												
2 c. milk.												
Hominy, boiled	a. h.	2 " "	100	79.30	2.20	9.0	.20	1.9	17.80	73.0	84	84
H-O, boiled	a. h.	2 " "	100	84.07	2.42	9.9	1.45	13.5	11.76	48.2	72	72
Indian meal mush	a. h.	3 " "	115	92.90	2.10	8.6	1.18	11.0	18.50	75.9	96	83
Macaroni, boiled	a. h.	2 " "	100	78.40	3.00	12.3	1.50	14.0	15.80	64.8	91	91
Macaroni, baked with cheese	a. h.	2 " "	140	54.42	19.06	78.1	20.46	190.3	43.44	178.1	447	319
Oatmeal, boiled	a. h.	2 " "	100	84.50	2.80	11.5	.50	4.7	11.50	47.2	63	63
Puffed rice	a. h.	5 " "	14	.99	.87	3.6	.08	.7	12.00	49.2	54	361
Rice, boiled	a. h.	1 " "	100	72.50	2.80	11.5	.10	.9	24.40	100.0	112	112
Shredded wheat biscuit	a. h.	1 biscuit.	29	2.35	3.05	12.5	.41	3.8	22.59	92.6	109	375

CAKES AND PASTRY.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Spaghetti, baked with to-	a. h.	3 h. tbsp.	145	111.21	4.52	18.5	2.81	26.1	25.76	105.6	150	103
mato	a. h.	2 " "	100	88.43	1.42	5.8	.26	2.4	9.36	38.4	47	47
Vermicelli, boiled	a. h.	2 " "	100	84.77	1.79	7.3	.34	3.2	12.92	53.0	64	64
Wheat germ, boiled												
9 Cakes, Pastry, Puddings, etc.												
A. *Cakes:*	a. h.	....	70	14.30	4.34	17.8	5.67	52.7	44.87	184.0	255	364
Chocolate layer	1 slice.	1x1½x3 in.	40	7.28	2.36	9.7	3.60	33.5	25.92	106.1	149	374
Frosted	1 "	2¾x2¾x½ in	44	7.61	2.60	10.7	4.80	44.6	28.20	115.6	171	388
Fruit	1 "	2x3x1 in.	60	11.28	3.48	14.3	5.40	50.2	38.10	156.2	221	368
Gingerbread	1 "	2x3½x½ in.	23	3.52	1.45	6.0	2.46	22.9	15.16	62.2	91	396
Sponge												
B. *Pastry:*												
Pie:												
Apple	a. h.	⅙ pie.	126	53.55	3.91	16.0	12.35	114.9	53.93	221.1	352	280
Cream	a. h.	⅙ "	126	40.32	5.54	22.7	14.36	133.6	64.51	264.5	421	334
Custard	a. h.	⅙ "	133	82.99	5.59	23.0	8.38	77.9	34.71	142.3	243	183
Lemon	a. h.	⅙ "	.110	52.14	3.96	16.2	11.11	103.3	41.14	168.7	288	262

PIES AND PUDDINGS.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Pie—Continued.												
Mince	a. h.	1/6 pie.	113	46.67	6.55	26.9	13.90	129.3	43.05	176.5	333	294
Squash	a. h.	1/6 "	133	83.39	5.85	24.0	11.17	103.9	28.86	118.3	246	185
C. *Puddings:*												
Bread pudding	a. h.	2 h. tbsp.	105	55.00	5.52	22.6	4.79	44.6	38.48	157.8	225	214
Ingredients:												
1 c. bread crumbs.												
1 c. milk.												
1 egg.												
½ c. sugar.												
¼ c. raisins.												
Chocolate pudding	a. h.	2 " "	95	53.45	4.99	20.5	7.90	73.5	27.83	114.1	208	219
Ingredients:												
1 oz. chocolate.												
2 h. tbsp. sugar.												
1½ tbsp. corn starch.												
1 c. milk.												
White 1 egg.												

PUDDINGS.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
C. *Puddings*—Continued.												
Custard puddings:												
Baked custard	a. h.	2 h. tbsp.	134	97.65	7.31	30.0	7.42	68.8	20.50	84.1	183	136
Ingredients:												
2 c. milk.												
2 eggs.												
¼ c. sugar.												
Chocolate custard ...	a. h.	2 " "	120	82.92	8.12	33.3	10.06	93.6	17.75	72.8	200	167
Ingredients:												
1 h. tsp. grated chocolate.												
1 c. milk.												
1 egg.												
1 h. tbsp. sugar.												
Rice custard	a. h.	2 "	110	71.90	6.46	26.2	5.04	46.5	25.80	105.8	179	163
Ingredients:												
c. boiled rice.												
2 eggs.												
1½ c. milk.												
2 h. tbsp. sugar.												

PUDDINGS.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fat Grams.	Fat Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
C. *Puddings*—Continued.												
Soft custard	a. h.	4 tbsp.	60	36.01	4.39	18.0	6.84	63.7	12.12	49.7	131	219
Ingredients:												
Yolk 1 egg.												
½ c. milk.												
1 h. tbsp. sugar.												
Indian meal pudding.	a. h.	2 h. tbsp.	164	95.16	9.02	37.0	10.16	93.9	47.02	192.8	324	197
Ingredients:												
3 c. milk.												
3 h. tsp. Indian meal.												
½ c. molasses.												
1 h. tbsp. butter.												
1 " " sugar.												
Snow pudding	a. h.	2 " "	80	63.59	4.52	18.5	.03	.3	11.73	48.1	67	84
Ingredients:												
¾ c. water.												
1 h. tsp. gelatin.												
2 h. tbsp. sugar.												
1 tsp. lemon juice.												
Lemon rind.												
White 1 egg.												

PUDDINGS.

Food Stuffs.	Portion.	Quantity.	Weight.	Water.	Protein.		Fats.		Carbo-hydrates.		Total Calories.	Calories per 100 Grams.
			Grams.	Grams.	Grams.	Calories.	Grams.	Calories.	Grams.	Calories.		
C. *Puddings*—Continued.												
Tapioca pudding	a. h.	3 h. tbsp.	110	74.81	5.85	23.8	6.12	56.7	22.25	91.2	172	156
Ingredients:												
2 c. milk.												
1 egg.												
3 tbsp. tapioca.												
2 " sugar.												
Tapioca and apples ..	a. h.	2 " "	100	70.86	.21	.9	.22	2.1	28.58	116.9	120	120
Ingredients:												
9 small apples.												
1 c. sugar.												
1 lemon.												
⅔ c. tapioca.												
2 c. water.												
D. *Miscellaneous.*												
Banana, peeled, baked with 1 h. tsp. sugar.	a. h.	1 banana.	100	65.30	1.30	5.3	.60	5.6	32.00	131.2	142	142
Banana, baked in skin.	a. h.	1 "	125	96.82	1.40	5.7	.70	6.5	25.03	102.6	115	92

BLANC MANGE.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
D. *Miscellaneous*—Continued.												
Blanc Mange I	a. h.	2 h. tbsp.	90	62.81	4.76	19.5	4.91	45.7	16.83	69.0	134	149
Ingredients: 1 h. tbsp. cornstarch. 1 h. tbsp. sugar. 1 egg. 1 c. milk. 1 tbsp. sherry.												
Blanc Mange II	a. h.	2 " "	100	85.70	3.63	14.9	4.40	40.9	5.50	22.6	78	78
Ingredients: ¼ c. Irish moss. 2 c. milk. Served or cooked with 1 tbsp. cream. 1 h. tsp, sugar.												
Doughnuts	1 doughnut.	d. 3½ in.	37	6.77	2.48	10.2	7.77	72.5	19.65	80.6	163	441

DESSERTS.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
D. *Miscellaneous*—Continued.												
Egg soufflé	a. h.	½ soufflé.	50	......	5.22	21.4	4.09	38.0	38.09	156.2	216	432
Ingredients:												
2 eggs.												
½ c. sugar.												
1 tbsp. lemon juice												
Floating island	a. h.	3 h. tbsp.	80	55.28	7.48	30.7	7.62	70.9	13.50	55.4	157	196
Ingredients:												
½ tsp. cornstarch.												
1 h. tsp. sugar.												
1 egg.												
1 c. milk.												
Ginger snaps	1 ginger snap.	d. 2¼ in.	5	.32	.33	1.4	.43	4.0	3.80	15.6	21	418
Ice cream	a. h.	2 h. tbsp.	100	66.09	5.21	21.4	10.16	94.5	17.73	72.7	189	189
Ingredients:												
3 c. milk.												
1 c. cream.												
3 eggs.												
⅔ c. sugar.												
Vanilla.												

DESSERTS.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
D. *Miscellaneous*—Continued.												
Ladyfingers	1.	4 in.	20	3.00	1.76	7.2	1.00	9.3	14.12	57.9	74	371
Macaroons	1.	d. 2½ in.	10	1.23	.65	2.7	1.52	14.1	6.52	26.7	44	435
Molasses cookies	1 cooky.	4x3 in.	20	1.24	1.44	5.9	1.74	16.2	15.14	62.1	84	421
Orange ice	a. h.	2 h. tbsp.	100	23.57	.94	3.9	.23	2.1	74.68	306.2	312	312
Ingredients: 2½ c. orange juice. ¼ c. lemon juice. 1½ c. sugar. 1 c. water. Rind 2 oranges.												
Prune soufflé	a. h.	2 h. tbsp.	85	61.53	3.31	13.6	.65	6.0	18.95	77.7	97	114
Ingredients: ½ c. stewed prunes (edible portion). White 1 egg.												
Sugar cookies	1 cooky.	d. 3. in.	11	.91	.77	3.2	1.12	10.4	8.05	33.0	47	423

DESSERTS.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
D. *Miscellaneous*—Continued.												
Sugar cookies, home made	1 cooky.	d. 2½ in.	5	.42	.35	1.4	.51	4.7	3.66	15.0	21	423
Spanish cream	a. h.	2 tbsp.	100	58.47	11.71	48.0	7.36	68.5	21.25	87.1	204	204
Ingredients:												
1 h. tsp. gelatin.												
2 h. tbsp. sugar.												
1 c. milk.												
1 egg.												
1 tbsp. sherry.												
10. Condiments and Sauces.												
Caramel sauce	a. h.	2 tbsp.	40	15.00		.....	......	.....	25.00	102.5	103	258
Ingredients:												
½ c. cugar.												
½ c. water.												

SAUCES.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Catsup, tomato	a. h.	tbsp.	20	16.56	.30	1.2	.04	.4	2.46	10.1	12	58
Chaud eau	a. h.	"	40	5.47	.01	.1	1.13	10.5	33.33	136.8	147	365
Ingredients:												
1 c. sugar.												
1 h. tsp. butter.												
⅓ c. water.												
Lemon juice.												
Cream sauce	a. h.	"	45	31.18	1.87	7.7	6.94	64.5	4.50	18.5	91	202
Ingredients:												
1½ c. milk.												
2 h. tbsp. flour.												
2 " " butter.												
French dressing	a. h.	1 dsp.	11	4.00	......	.....	8.00	74.4	....	......	74	673
Ingredients:												
4 tbsp. olive oil.												
1 " vinegar.												
¼ tsp. salt.												
Pepper.												

SAUCES.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Hollandaise sauce	a. h	2 tbsp.	40	18.65	1.85	7.6	17.37	161.5	.32	1.3	170	425
Ingredients:												
½ c. butter.												
Yolks 2 eggs.												
1 tsp. lemon juice.												
Salt, cayenne pepper.												
Mayonnaise dressing	a. h.	1 "	21	.84	.26	1.1	19.92	185.3	.05	.2	187	890
Ingredients:												
2 eggs.												
2 c. olive oil.												
1 tbsp. vinegar, or												
1 " lemon juice.												
Salt, pepper, mustard.												
Olive oil	....	1 "	13	......	......	.....	13.00	120.9	....	......	121	930
Olives, green	....	1 large.	9	3.80	.07	.3	1.82	16.9	.77	3.2	20	226
Wine sauce	a. h.	3 tbsp.	40	17.79	1.43	5.9	1.24	11.5	19.42	79.6	97	243
Ingredients:												
1 egg.												
½ c. sugar.												
3 tbsp. milk.												
2 " sherry.												

SWEETS AND NUTS.

FOOD STUFFS.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
11. MISCELLANEOUS SWEETS.												
Honey	......	1 tbsp.	30	5.46	.12	.5	......	.....	24.36	100.0	101	335
Maple syrup	......	1 "	30	......	......	.....	......	.....	21.40	87.9	88	293
Sugar:												
Cube	......	1 cube.	7	......	......	.....	......	.....	7.00	28.7	29	410
Domino	......	1 domino.	6	......	......	.....	......	.....	6.00	24.6	25	410
Granulated	......	1 h. tsp.	10	......	......	.....	......	.....	10.00	41.0	41	410
Powdered	......	1 " "	12	......	......	.....	......	.....	12.00	49.2	49	410
Maple	......	1 cake.	100	......	......	.....	......	.....	82.80	339.4	339	339
12. NUTS.												
Almonds	......	10 large.	15	.72	3.15	12.9	8.23	76.5	2.60	10.7	100	668
Brazil nuts	......	10 "	60	3.18	10.20	41.8	40.08	372.7	4.20	17.2	432	720
Chestnuts, roasted, as purchased	Handful	20 nuts.	50	18.90	2.60	10.7	2.25	20.9	17.70	72.6	104	208
Cocoanut	1 slice.	2x2x½ in.	34	4.79	1.94	8.0	17.20	160.0	9.49	38.9	207	608
Filberts	......	10 nuts.	10	.37	1.56	6.4	6.53	60.7	1.30	5.3	72	725
Peanuts, as purchased	Handful	15 "	30	2.07	5.85	24.0	8.73	81.2	5.55	22.8	128	427

NUTS AND BEVERAGES.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Pecans		10 large.	30	.90	3.30	13.5	21.36	198.7	3.99	16.5	229	762
Pistachios		10 "	5	.21	1.12	4.6	2.70	25.1	.82	3.4	33	660
Walnuts		10 "	42	.05	7.73	31.7	27.05	251.6	5.46	22.4	306	728
13. Non-alcoholic Beverages.												
Cocoa		1 cup.	227	176.86	9.08	37.2	15.53	144.4	23.85	97.8	279	123
Ingredients:												
1 h. tsp. cocoa.												
1 " " sugar.												
¾ c. milk.												
1 tbsp. cream.												
Coffee or tea		1 "	246	217.17	2.80	11.5	7.64	71.1	17.83	73.1	156	64
Ingredients:												
¼ c. milk.												
1 tbsp. cream.												
2 cubes sugar.												
Coffee or tea.												

BEVERAGES.

Food Stuffs.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Eggnog		1 glass.	270	212.15	13.00	53.3	12.85	119.5	29.50	121.0	294	109
Ingredients:												
1 egg.												
1 h. tbsp. sugar.												
¾ c. milk.												
1 tbsp. sherry.												
Lemonades:												
Egg lemonade		1 large glass.	314	259.20	6.70	27.5	5.25	48.8	42.35	173.6	250	80
Ingredients:												
1 egg.												
2 h. tbsp. sugar.												
2 tbsp. lemon juice.												
¾ c. water.												
Lemonade with white of egg		"	297	250.20	4.10	16.8	.08	.7	42.35	173.6	191	64
Ingredients:												
White 1 egg.												
2 h. tbsp. sugar.												
2 tbsp. lemon juice.												
¾ c. water.												

BEVERAGES.

FOOD STUFFS.	Portion.	Quantity.	Weight. Grams.	Water. Grams.	Protein. Grams.	Protein. Calories.	Fats. Grams.	Fats. Calories.	Carbohydrates. Grams.	Carbohydrates. Calories.	Total Calories.	Calories per 100 Grams.
Lemonades—Continued.												
Plain lemonade	....	1 glass.	264	221.65	......	.....	......	.....	42.35	173.6	174	66
Ingredients:												
2 h. tbsp. sugar.												
2 tbsp. lemon juice.												
¾ c. water.												
Malted milk [4]	....	1 cup.	235	191.86	9.71	39.8	10.12	94.1	21.19	86.9	221	94
Ingredients:												
1 h. tbsp. malted milk.												
⅞ c. milk.												
Mellin's Food [4]	....	1 "	225	191.71	7.66	31.4	8.80	82.0	15.10	62.0	175	78
Ingredients:												
½ tbsp. Mellin's Food.												
⅞ c. milk.												

APPENDIX

WAR DIETING

The problem of war dieting depends very largely upon the amount and kind of foods available and the number of individuals to be fed. As is well known, in countries where there has been very great shortage of the essential articles, regulation is done by issuing cards containing small vouchers for the daily ration. These must be used upon the day the date of which they bear, are not transferrable, and are issued to all entitled to them. The fighting army is necessarily the first concern and next to this the infants and children, those who are to become active belligerents in the future, and the other members of the population in order of their usefulness.

It would seem that the most important consideration is the conservation of the animal fats, perhaps with the addition of those nut oils containing vitamins. Next to the fats come the animal protein foods, meat, milk and eggs, next the vegetable proteins, and after these the carbohydrates. The problem in America has been and is to feed the Allies and to this end the saving of the wheat and the saving of the meat, especially beef, are of primary importance. In January, 1918, the United States Food Administration issued a home card which contains the first restrictions. The suggestions are to have two wheatless days, Monday and Wednesday, in every week, and one wheatless meal in every day; to have one meatless day, Tuesday, in every week and one meatless meal in every day. Originally two porkless days were added, Tuesday and Saturday. In addition to these restrictions for voluntary rationing hotels and public eating places put a limit on bread, two ounces of bread being allowed at a meal or four ounces of quick bread, and the amount of sugar limited to each person. The additional suggestions were to make every day a fat-saving day, every day a sugar-saving day, to use fish, poultry and eggs, all perishable foods, fruits, vegetables and potatoes abundantly. There is a special caution regarding the use of milk, using whole milk for children, taking care not to waste any that is left over, but to use it in cooking or making cottage cheese. The army of the Allies is in need of wheat, butter, lard, sugar, bacon, beef, mutton and pork. Those remaining at home can use in place of wheat, corn, oats, barley and rye, for the fats the people may substitute cottonseed oil, peanut oil and drippings, this last named for cooking. In place of sugar, molasses, honey, and syrups, and to supply protein

in place of the more desirable meats, poultry, eggs, and fish, cheese, nuts and beans.

The eating habits of a nation are not very easily changed and all nations eat of the food available, so that changes are difficult to make, first on account of the taste, second, on account of the lack of information concerning cooking and serving new foods. The new dishes should be as attractively arranged as possible and only one added to a meal at a time, giving the individual an opportunity to become accustomed to the changes as gradually as possible. This is not only important to keep the consumer from becoming tired of the new dish, but enables the body to prepare the necessary digestive juices in case there is a change in the composition of the food, and prevents irritating diarrhea in case of use of coarser breads or vegetables.

There are a number of rules given for purchasing food, perhaps the simplest ones are not to save on milk, and to spend at least as much for milk as for meat and as much for vegetables and fruits as for meat and fish, and to remember that cereals and bread stuffs are ordinarily the cheapest foods, and the meats the most expensive and the animal fats the most expensive of all. The fat allowance suggested for American people was twelve ounces a week for each adult and six ounces per week for each child. A suggestion is given to substitute vegetable fats wherever possible. Animal fats should not, however, be entirely excluded from the dietary as they contain substances essential for growth and health.

The suggestion made for saving wheat is to cut down the use to one-quarter of that formerly used, substituting for wheat flour the flours made from barley, rice, potatoes or corn for one-quarter, and for the other part the use of potatoes, either white or sweet, rice and hominy, and other cereals can easily be accomplished. The saving of meat is best accomplished by doing without the meats essential for the army, by using "meat extenders," that is, using a small amount of meat to flavor a dish of rice or hominy or other vegetable, by using meat less frequently, by serving smaller portions, and lastly by substituting cheese, eggs, fish, game, poultry, and dried beans and peas.

The saving of fats is best accomplished by using butter as sparingly as possible, except for children, and in cooking to use some of the vegetable oils. Avoid the use of pastry entirely or almost so, and use vegetable fats in making them. The sugar saving is best accomplished by lessening the use of sugar in tea and coffee, omitting candy, cooking breakfast cereals with chopped figs, dates or raisins and so avoiding the use of sugar and substituting the use of honey, molasses and other sweetening. In place of puddings or desserts fresh fruits or baked fruits should be substituted. Cake should be given up altogether or limited and the frosting made without the use of sugar.

As to standards for the civilian population in war-time, the low protein limits of Chittenden may be used in the lower caloric estimates for the total ration. It should be remembered that while the protein in war bread is nearly the same as in ordinary bread, the amount that is available is less and this is also true of certain other foods. Proper instruction in methods of preparing foods so as to avoid waste through cooking and through improper selection is very important. The American people waste enormous amounts of food through serving badly chosen and poorly balanced meals. It would be extremely interesting when the war is over to see whether such diseases as gout will have become less frequent and also what disease conditions the strict rationing has produced. War edema has been noted elsewhere in the book. There is certainly less constipation and in many instances irritating diarrheal affections have set up.

The National Food Administration has prepared a large number of recipes suitable for making dishes without the use of the foods which it is necessary to save.

The dieting of prisoners of war in Germany has been made the subject of a considerable amount of study. One article giving a good summary is by Taylor (Journal of the American Medical Association, November 10, 1917, p. 1575). The rationing of the prisoners was under a man who was familiar with animal nutrition, but evidently not acquainted with modern investigations on growth. In some of the prison camps the fare was not impossible even if scanty, whereas in others the carelessness of preparation led to the furnishing of a very unsatisfactory diet. In order to utilize the meats to the fullest they were served in the form of soups which left nothing to chew on, and exceedingly unsatisfactory when continued for long periods of time. Considerable hardship also resulted from the extensive use of potatoes in place of bread and the fact that the bread is black sour bread, unpalatable to the French and English, but apparently not to the Russians. As Taylor remarks, the feeding was done on the basis of the modern stock farm, and men were dieted like domestic animals.

The following tables show two weekly diet sheets, one during the period before the stringency in food stuffs and one after it had started.

Weekly Diet Sheet Typical of Period Prior to Stringency in Foodstuffs.[1]

	Gms.	Ounces		Gms.	Ounces
Bread	2,100	75	Sugar	200	7.1
Flour	270	9.6	Legumes	150	5.3
Meat	300	10.7	Fat	70	2.5
Fish	300	10.7	Maise grease	180	6.4
Herring	150	5.3	Pearl Barley	100	3.5
Potatoes	9,000	321	Dried fruit	50	1.8
Vegetables	1,800	65	Marmalade	100	3.5
Skim milk	400	14	Tea	16	0.5
Sausage	200	7	Spices, herbs	30	11.1
Cheese	100	3.5	Cocoa	40	1.4
Nutrient yeast	40	1.4			

[1] Per diem: protein, 89 gm.; fat, 30 gm.; carbohydrate, 510 gm.; calories, 2,740.

Weekly Diet Sheet Typical of Period of Stringency in Foodstuffs.[1]

	Gms.	Ounces		Gms.	Ounces
Bread	2,100	75	Fat	65	2.3
Flour	50	1.7	Maise grease	100	3.5
Meat	200	7	Pearl barley	60	2.1
Sausage	200	7	Fruit	300	10.7
Fish	325	11	Marmalade	100	3.5
Potatoes	3,500	125	Tea	4	0.15
Vegetables	1,650	59	Coffee	6	0.21
Skim milk	500	17	Chicory	15	0.5
Cheese	100	3.5	Cocoa	40	1.5
Nutrient yeast	20	0.7	Spices and herbs	20	0.7
Sugar	130	4.8	Mustard	50	1.7
Legumes	150	5.3			

[1] Per diem: protein, 57 gm.; fat, 21 gm.; carbohydrate, 310 gm.; calories, 1,720.

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